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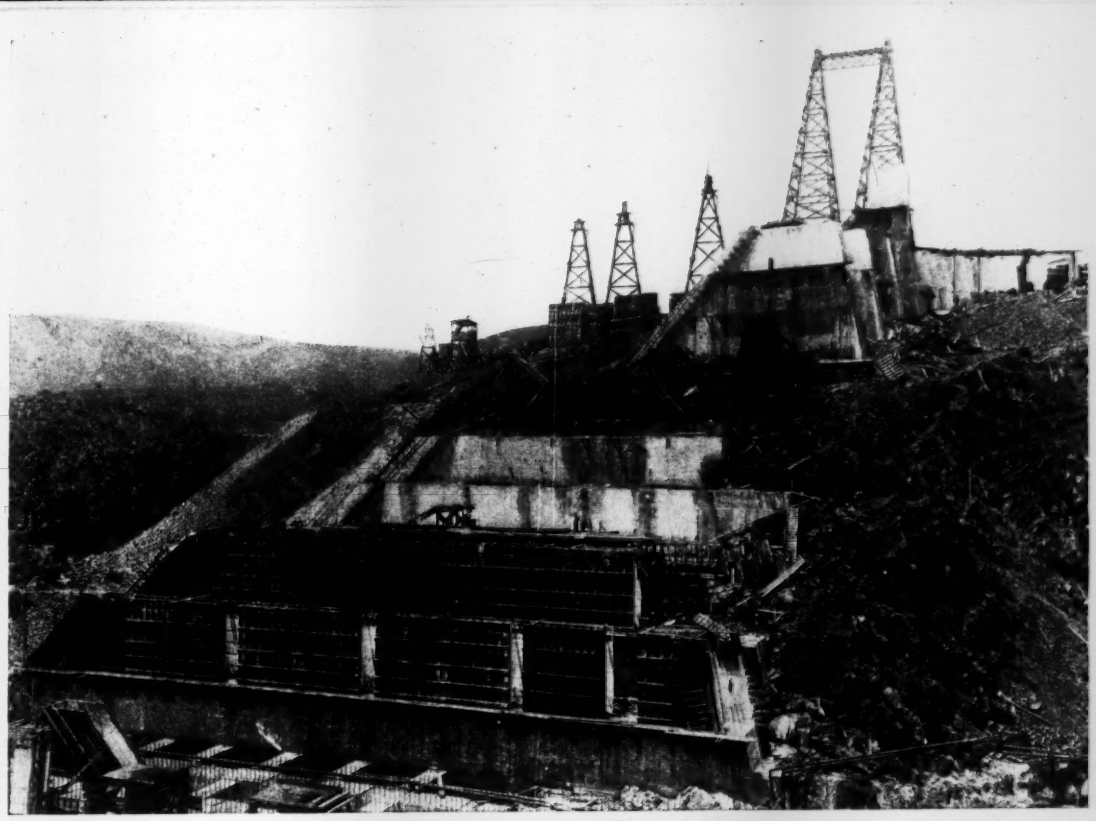

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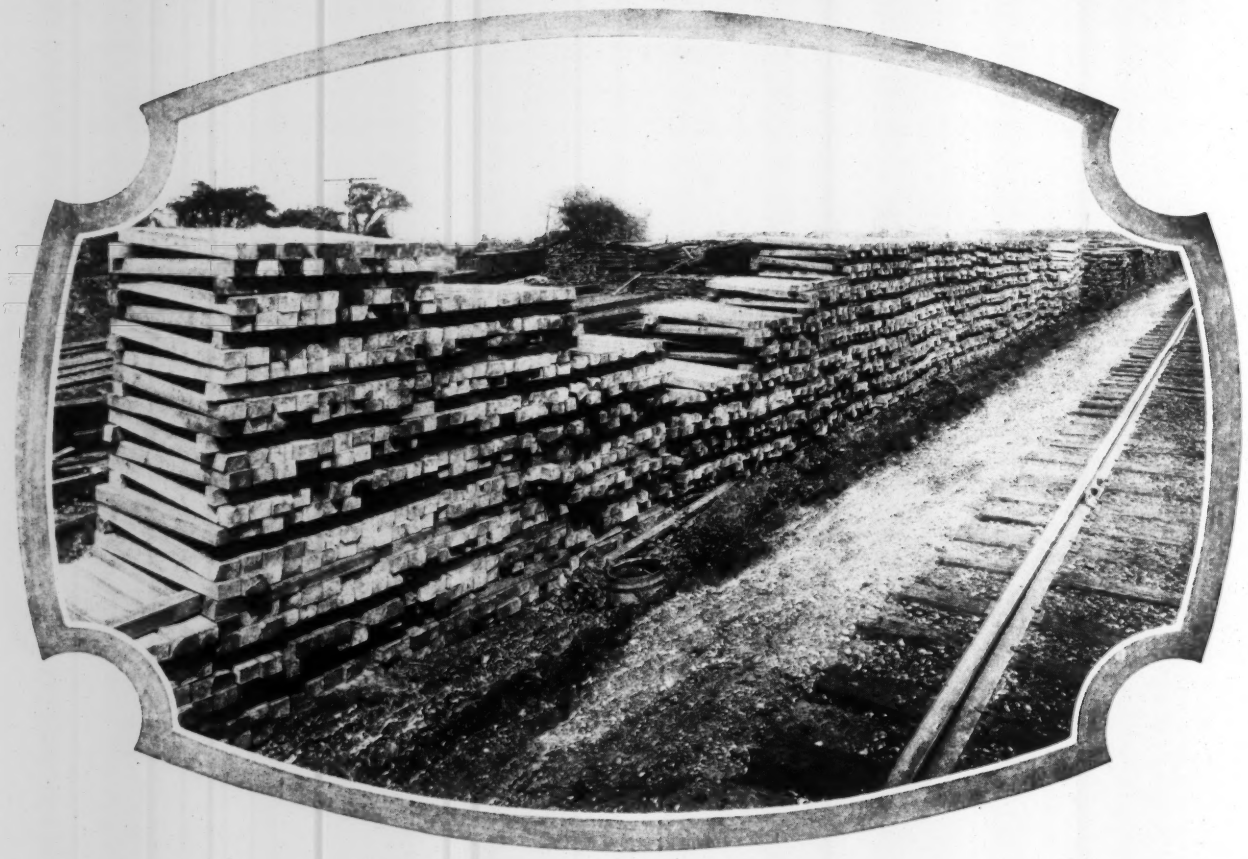

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CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
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NUMBER OF COPIES PRINTED THIS ISSUE, 30,511

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
PHILADELPHIA, 1600 Arch Street
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A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, OCTOBER 16, 1930 Number 16

Student Constructors

IN GRANTING a charter for a student chapter to the North Carolina State College, the Associated General Contractors have taken a forward step in creating an interest in construction among undergraduates. Actual teaching of construction in technical schools is, for the most part, neither practicable nor desirable. But to give the student an insight into the construction field and its opportunities, to give him a preliminary idea of construction procedure, and to indicate the type of mind and disposition best suited for construction is desirable work that can be carried on by contact between the national association and branch and student chapters. More and more is the personnel of construction organizations being made up of technically trained men. The construction industry will benefit by giving a little attention to those embryo engineers who will some day carry on its activities.

Beginning of Reform

STIRRINGS in the direction of creating a better financial basis for house building may be discerned in several different quarters. Were anything needed to emphasize their importance the present low state of residential building activity would supply a forcible argument. The building shortage reacts directly on general business activity and helps to maintain the slackness prevailing for some months past. Of the factors underlying the low building activity, high labor costs and poor financing are probably the principal ones. An associated factor is the absence of means for establishing assured values in dwelling-house property. But this lack could be overcome by systems of appraising location and plan values, coupled with a system of inspecting and certifying construction work. Some attempts in the latter field are under way. Their success may prepare the way for methods of establishing a free money market for house building, and fixing low interest rates comparable to those which commercial business enjoys.

Water Rights Again in Court

THIS week the Supreme Court of the United States granted Arizona permission to file its suit against construction of Boulder dam. The way is thereby cleared for speedy determination of an issue that has divided the Western states for nearly a decade. Though the questions raised by the suit center on legal technicalities, back of them lies the claim that the great enterprise is so planned that it will injure Arizona or deal with it unjustly; and this claim, however partisan, should have a clear and final decision. It has been so heavily masked in political intrigue and in varied demands for water allocation, for power and for revenue, that the original cause of dissension, the imperfect division of water by the Colorado River Compact, has been lost to view. Determination of the Arizona suit is likely to add fundamental points to the doctrine of water and power rights, including long-disputed questions surrounding federal and state jurisdiction over interstate streamflow. Rapid progress of the suit, with elimination of all needless delay, is desirable. It is unlikely to interfere with progress of the construction work, but the cloud of claim and protest should be dissipated at the earliest possible moment.

Underpass Center Piers

PRESENT-DAY highway traffic and public safety demand unobstructed roadways. At huge cost we are widening streets and roads, eliminating bottlenecks and bad turns, and removing pedestal signals from intersections, all for the purpose of providing adequate and safe means for free-flowing vehicular traffic. Additional millions are being spent in grade-crossing eliminations for the same purpose. Yet a tour of the country reveals that surprisingly many grade separations of the underpass type are being built with a center pier or row of columns dividing the roadway. A two-lane roadway is encumbered by a serious added hazard when its clear traffic width is blocked and split into two single lanes by such a structure. In the face of strenuous efforts being made to eliminate highway obstructions, there is little justification in continuing this practice. Cost and standard practice seem to be the main arguments in its favor. But grade separations are permanent improvements, built to last for an indefinite time. The saving of cost of short spans and center columns over clear spans is not worth the hazard to present traffic and to increased future traffic. As for the other argument, it is high time that standard practice in underpass construction be revised so as not to defeat its essential purpose, that of providing safer highways.

For Program Makers

FEW organizations come close to the ultimate possibilities in bringing out discussion, but a good approach to this ideal goal was achieved by the International Association of Street Sanitation Officials, meeting last week in Louisville. Perhaps it was the effect of the program—a delightfully informal arrangement, with a dozen subjects for discussion and four to six speakers for each, with few time limits and complete disregard of narrow rule as to order of discussion. Questions and answers came thick and fast. Perhaps also the informal arrangement of the room had its effect: tables simulating an after-banquet setting unconsciously put the members at ease and promoted the round-table spirit. All of this was in direct contrast to the technical and formal meetings of the American Society of Civil Engineers in St. Louis the previous week. Both meetings were full of meat, and there is no occasion for invidious comparisons; but the methods of the two meetings were so essentially dif-

ferent as to stir up the curious reflection that perhaps some day a psychological study of meeting technique will give us a new insight into society efficiency.

Place for Publicity

PROGRESS toward the re-use of fouled water supplies or sewage in those communities where such a practice seems an ultimate necessity cannot be expected to gain the public backing necessary to its adoption without educational work. Engineers understand the measures required for reclamation of sewage, and know the desirability and feasibility of such practice where every drop of water is at a premium. The layman does not, and his prejudice must be removed by enlightenment. To him sewage is a synonym for filth, and he does not recognize that in reality it is a stream of water temporarily used to transport a relatively small amount of foreign matter—998 parts water to 1 part of organic and 1 part of mineral matter is a liberal statement. The public should learn this, and also learn that engineers are now able to relieve this conveyor stream of its small load of waste, reclaiming the original water and making it useful for industrial processes, irrigation and the replenishment of groundwater supplies. If the layman could be given this new concept of sewage and its reclamation, his prejudice would in time disappear. Particularly in the Southwest, where the rising costs and the decreasing supplies of water for city supply indicate re-use as a future help to the water-resources problem, it would be logical to carry on public education concurrently with research.

Like the Lion's Roar

PNEUMATIC riveters make as loud a sound as a roaring lion—this is the finding of acoustical experts who conducted sound measurements for the noise commission of New York City. It conveys a tangible conception of the part which construction noises play in the piling up of city din. Carrying its studies and observations farther, the commission leads up to some remarks that give the construction industry food for thought. "The time has come," says the commission, "when the attention of manufacturers and users of contractors' appliances should be forcibly directed to the fact that when such equipment is to be used within the confines of a municipality its operation must be made as noiseless as is practicable." Building operations and subway construction are the main classes of work to which this statement refers. It reflects quite clearly the commission's belief that noise-making should be restricted, a belief derived from a review of the harmful effects of noise on human well-being and efficiency. The same attitude is expressed in another passage on construction noises: "The most likely remedy is not to permit within the city after 5 p.m. or before 8 a.m. any construction activity in which unnecessarily noisy equipment is used. Under no conditions should internal combustion and steam or compressed air engines be permitted to operate without mufflers or silencers attached to the exhaust. Adequate mufflers should be required on the intakes of all air compressors." Conclusions of this kind, backed by an extensive and rapidly growing public hostility to city din, foreshadow a coming campaign in which construction may be subjected to new and possibly undesirable regulatory laws and supervision. But the burdensome effect of regulation can be forestalled; the industry can eliminate excessive noise before compulsion comes along.

International Discussion

FULLY realizing the expectations that were voiced in this column a month ago, the International Road Congress held last week at Washington was a noteworthy, in many respects a brilliant, gathering. The observer could not fail to be impressed with a profound sense of its importance. Credit for its success must be given both to the skill and painstaking preparatory work of the organizing committee and to the vitality of the purpose back of the assemblage.

As an instrumentality for international discussion of road problems the Congress is of much meaning to the world, and not least to the United States. It justifies fuller study than merely enough to determine its success. Other international assemblages do not possess this keen interest. What results from an international engineering congress, for example, is of relatively little moment; the art concerned is rooted much more deeply than any congress discussions, and its soundness and growth do not depend on international congresses. But in the matter of roads the case is essentially different. The art is primitive and in flux, the science even more so, and thorough comparison of conditions and experiences the world over is sure to exert a vital influence on progress.

Someone remarked, in a happily expressed speech at one of the congress functions, that the world is in the midst of a great revolution brought about by the motor vehicle and its road requirements. This revolution may perhaps prove to be as far-reaching as that due to the railway. In such case we ought to be quite sure that we avoid the mistakes and random evolution of the former age; and this conviction, no doubt, is behind the serious purpose which animated the participants in the Washington congress. They were deeply concerned in their own problems of building and keeping up roads adequate for coming transport requirements. In part they came to see what the United States has done with its roads, but in larger part their purpose was to compare their own difficulties and methods with those of other countries, in order that they might interpret their needs more accurately and build more efficient and economical roads.

All the world is groping to discover the right course in dealing with roads, and meanwhile is conscious of making huge expenditures without being certain that they are rightly directed. It recognizes that intensive study and free discussion between the road men of different lands will soonest remedy this condition. Hence the prominence of large-scale research in road problems, and hence also the strong interest centered in the international congress.

Wherein lay the chief strength of the congress? The week at Washington revealed very clearly not only the serious purpose of the participants but also their intense desire to interchange views and experience on every element of road activities. Their discussions in the lobbies, in the street or in private gatherings were fully in proportion to the keen attention which they gave to every detail of the exhibitions and inspection tours. Interchange of knowledge and opinion, and comparison of differing physical and human factors of the problem, were highly effective in these outside discussions. Here, in fact, was the essential life of the congress. The formal sessions, on the other hand, were of quite minor character; they served only as background chorus to the effective dialogue.

That the sessions of the congress were meager in

results, when measured by any standards proportioned to the purpose of the gathering, may be judged from the factual report published in this issue. The vital troubles of road planner or builder—and these troubles are myriad in number—were barely grazed. To take a single example, the formidable problem of earth and other low-cost roads, which constitutes the essential question confronting great areas of the outside world as well as large sections of the United States, received virtually no aid whatever from the congress, though it was among the six questions to which the entire proceedings were confined. Development of earth roads will have to go on with no help from this congress of the world's leading road technicians. On one or two other questions the results achieved were slightly more definite and influential—for example, on finance; but as a whole the production of the technical sessions was disappointing.

This result is not unexpected or unnatural, and can readily be understood when the working of the congress is considered. In such consideration one must recall with due sympathy the complex conditions of international action as faced by the men who devised the congress procedure. Yet this cannot be allowed to obscure the resultant facts.

The road congress is quite unlike a free technical society, whose activity as well as strength is determined by the pressure of the joint interest of its members. The congress program is fixed by a central group, not by the initiative or inspiration of the members. The authors of its papers—called reports—are selected, not voluntary. The reports themselves are not laid before the meeting for discussion; only the conclusions formulated by a reviewer are discussed. The congress participants are mainly official groups representing their respective governments. At Washington none but official delegates participated in discussion, and these only as spokesmen for their groups, not as individuals having independent thought. Long before the congress sessions, the discussion of the different national groups had been prearranged and the speaking rôles distributed. Voting on conclusions or resolutions, moreover, was by countries rather than by convictions—one vote per country. With such form of procedure, applied to a program of limited and highly generalized character, the result already indicated appears inevitable.

This outline of the conditions affecting the work of the congress is given because effective international study of road problems seems to us profoundly important at this time. Free and active exchange of views between the roadbuilders of the entire world can do very great service to the art, and thereby to every country, not least our own. The congress gatherings are now productive mainly through their unofficial contacts; could they be doubled in value by strengthening the formal sessions, their present usefulness would be increased most significantly.

It may not be practicable to accomplish this; the conditions imposed by past history and established precedent may make improvement impossible. In that event, possibly the separate national groups which are to be created under a resolution of last week's congress may prove to constitute an equivalent resource, for their local discussion could be transmitted to other national groups and thereby achieve a measure of exchange of view. But whether by this course or by modification of congress procedure, the creation of a medium for effective international road discussion is most urgently to be sought. It is an objective worth the best efforts of the world's road engineers and administrators.

Higher Bars for Engineers

SHOULD high educational bars be set up to be surmounted by aspirants for a license to practice engineering? Would such bars serve to exclude from the profession men corresponding to many present-day leaders in engineering who have had little or no schooling in the basic sciences? These are questions which are receiving serious consideration in many states where license or registration laws exist.

Most registration laws were written with full recognition of the limited scientific education of many of the country's ablest engineers. The framers of the laws did not want to set up bars which would keep similar men out of the profession in the future. This spirit finds expression in the uniform registration law now up for approval before the engineering societies of the country. Not even a high school education is required of engineers under that law. Its only limitation is that they should have had at least seven years of active practice of a character satisfactory to the board of examiners. The same is true of some of our state laws. Their only bulwark of defense against the inclusion of unqualified men is the integrity of the board and the height of its standards of what constitutes the practice of engineering.

In theory such a method of passing upon an applicant's qualifications may be quite correct, but in practical application it proves defective and weak. It is unfair to the board because it fixes upon it the responsibility of having to go too minutely into a man's practical experience and his resultant skill and ability in order to determine whether in fact he is an engineer or simply a skilled craftsman in engineering work. Also, it gives the board of examiners no basic requirements upon which they can reject a man of the craftsman type without appearing to do it for personal rather than legal reasons.

On the other hand, this method is unfair to the applicant. The board may set the limit of what it considers a satisfactory amount of engineering work so high as to exclude all but the most expert engineers. That was done in one state some few years ago. Further, the lack of any measure of engineering training for the man who has not taken a college course makes it possible for the board to refuse a license to a man who could prove his qualifications were some measure set up.

Higher standards for basic engineering training are needed. Engineers cannot longer hold out for a professional status without them. They must follow the lead of the medical profession. Years ago it contained many able practitioners of limited training. But who would today think of employing a physician lacking the college and medical-school training required of aspirants to the medical profession? No one! Yet these same requirements have not reduced the profession to a level of mediocrity. Men of genius are still found there.

So will it be with the engineering profession. The setting up of higher educational requirements will not exclude the Eads and the Morisons of coming generations. The same force which pushed those men to the front of their profession will find a way for similar men in the coming generation to surmount the bars of higher educational training. Higher bars will serve to keep out men who do not belong there. If engineering is to continue to be classed as a profession rather than a vocation its adherents will have to have high educational qualifications. Let us put up the higher bars, and put them up now.

Unique Cutoff Construction and Arched Foundation

Features of Rodriguez Dam

Fault in Streambed Dictates Foundation Work on Highest Ambursen Dam—Cutoff Excavated Through Shafts and Poured as Sinking Advances—Arch Supports Four Buttresses Over Inferior Rock

BUILDING a cutoff wall from streambed downward as excavation was advanced through shafts and providing an arch to support four buttresses of the highest Ambursen-type dam ever built, were innovations in foundation construction used at Rodriguez dam, now under construction on the Tijuana River near Tijuana, Mexico. A serious fault in the streambed revealed only by actual excavation work was the principal reason for the unusual foundation treatment. The structure will be 187 ft. high above streambed elevation and about 240 ft. high above lowest foundation rock. With a crest length of almost 2,200 ft. it will store 110,000 acre-ft. of water for an irrigation development of the Mexican government in the valley below the site. The foundation problems encountered and the resulting design developed are described in the following.

Above the Rodriguez site, which is about 27 miles southeast from San Diego, Calif., and about 9 miles east of Tijuana, Mexico, the river has a drainage area of 940 square miles. Flow of the stream is similar to other rivers of the region and is characterized by periods of from five to seven years with extremely small annual runoff, necessitating long holdover storage. The occasional floods which provide the bulk of the supply to be reservoired may be flashy and severe. The largest flood of record was a discharge of 70,000 sec.-ft. in 1916 at a point immediately below the Rodriguez site where a secondary tributary provided 115 square miles of additional catchment area. It is estimated that a flood of 150,000 sec.-ft. at the site may be expected and the spillway will be designed for the passage of this quantity of water.

The dam site consists of a gorge about 130 ft. deep and 750 ft. wide at the top, above which elevation the canyon walls continue on gentle slopes. On the west bank a low saddle provides a natural location for the spillway structure which will return the flood water at right angles to streamflow about 300 ft. below the dam.

Geological Conditions—Rock, which was exposed over much of the site, consists of rhyolite and granite with a fused contact, indicating watertightness on this plane. In the lower part of the gorge the rock surfaces were hard and fresh, although broken. Farther up on the slopes the rock surfaces were weathered and somewhat disintegrated over some areas with considerable overburden. Cleavage planes are evident on either side, dipping toward streambed.

As a preliminary investigation to determine the probable foundation conditions to be expected, nine borings were made in streambed and about fifty test pits were excavated at higher elevations. Results of the borings in streambed indicated suitable foundation rock at five locations at depths not to exceed 50 ft. Cores could not be obtained in the other holes but two indicated sharp clean rock chips and the remaining two showed rather definite evidence of disintegration. Sidehill exploration indicated that suitable foundation rock could be secured at depths varying from 10 to 40 ft. Geological examination of the site at this time resulted in a report which concluded that the rock at the streambed would be found suitable for the foundation of a concrete dam.

FIG. 1—EARLY STAGE OF FOUNDATION CONSTRUCTION, RODRIGUEZ DAM
Streambed stripping in progress. Reservoir site in background.

Study of the type of structure best suited to the foundation conditions was made with particular care. The lack of an adequate supply of material for a rock or earthfill dam, together with the necessity of providing a long spillway apron, eliminated these two types. Abutment rock in the canyon was considered inadequate for a concrete arch and at higher elevations concrete abutments of excessive yardage would have been required. The weak and shattered foundation rock with resulting uncertainty of uplift conditions were major factors against the building of a concrete gravity dam and a multiple-arch design was eliminated because of abutment conditions and earthquake possibilities. Final selection of an Ambursen-type dam was based primarily on the advantage of an articulated structure in case of foundation settlement or minor earth movement and the necessity of securing low foundation pressures.

Following the decision to build the dam at this site and the determination of the type of structure a contract was awarded in February, 1928. Foundation excavation work uncovered bedrock at depths of about 35 ft., as had been expected, but it proved considerably broken and unsuited for buttress foundations. A more serious difficulty was the finding of a pronounced fault about 20 ft. wide parallel to the stream along the sound rock of the east bank. This rock extends down almost vertically below streambed elevation to form the hanging wall of the fault. A smaller, secondary fault about 4 ft. wide near the center of the streambed parallels the major one and dips slightly toward it, indicating a junction at a considerable depth. In addition, deeper excavation along the line of the cutoff showed that a weak, inferior bedrock could be expected to continue below the existing elevation of foundation excavation.

Further and more extensive geological inspection of the site was made in the light of foundation excavation and the comprehensive report of Dr. F. L. Ransome outlined conclusions which may be briefly summarized as follows: (1) Although satisfactory in most respects, the site has a serious weakness occasioned by the river following a fault zone at this location; (2) the fault, apparently, has not been active for the past hundred years and, although movement is not to be expected, there is no certainty that it will not occur in the future; (3) although the fault must be considered objectionable, and the possibility of future movement cannot be entirely disregarded, the risk is not considered sufficient to justify condemnation of the site, considering the work already done; (4) realization of the existing geological conditions will make it possible for the engineers to take precautions to reduce the chances of failure in the structure to a minimum.

Cutoff Excavation—Excavation was started in open trench for the cutoff wall, 180 ft. long at streambed level and 11 ft. wide. At a depth of about 25 ft. difficulty was encountered in holding the heavy ground and sloughing sides. By this time the foundation excavation had revealed the fault and it became apparent that the cutoff would have to be extended much deeper than had been anticipated. In addition, there was a possibility of losing the excavation in the approaching flood season. The result was a change in plan and a decision to fill the trench with concrete, leaving openings which could be used as shafts to extend the cutoff deeper. Work already done on the cutoff made it economical to use the trench already excavated rather than to begin a new excavation which probably would have been arched upstream. The size and location of shafts also were fitted to the existing trench, as shown in Figs. 2 and 3.

Extension of the cutoff below the bottom of this first pour was carried on through the shafts. The procedure, in brief, consisted of excavating under the area of the wall for a depth which did not necessitate timbering (usually 8 to 15 ft.), placing reinforcing steel and forms to carry forward the shaft openings and then pouring concrete. The method has been used to carry the cutoff wall to a depth of 150 ft. below streambed, and, whereas the east wall (see drawing) and the main fault have carried down almost vertically, the good rock on the west side has closed in until the length of cutoff at this depth is only about 90 ft. Similarly the dip of the minor fault has continued and a junction is expected within the next 30 ft. Below this point the depth to which the cutoff must be carried to be effective against seepage in the fault zone is problematical but a total depth of 300 ft. is not improbable.

The method of excavation is typical of mining procedure. Removal of material from all shafts, except the one through the main fault, is done with a stiff-leg derrick (Fig. 5) from a single set-up. The depth of excavation anticipated at the fault and the amount of unsound rock to be removed from the hanging wall made a headframe advisable over the shaft at this location.

Following excavation of each level the section is prepared for concreting. Reinforcing steel in both directions is placed to provide strength at shaft openings. The lower ends of the vertical bars are hooked and protected by small wooden forms during concreting so that excavation of the following section makes them available. The upper ends of the bars are fastened into similar hooks provided above to make the vertical steel continuous. Concreting, after the shaft forms had been set, proceeds with workmen able to assist in the placement much of the time because of the flexibility in pouring operations provided by the number of shafts.

Provision for grouting the cutoff includes numerous diagonal holes extending into the walls where rock is broken or seamy, a double row of vertical holes in the bottom end and an extra number eastward of the fault. The original plan was to grout after the cutoff had been completed but water seeping down the sides of the cutoff interfered with working conditions, making it advisable to use some of the holes for low-pressure grouting merely to improve conditions. The results have been very satisfactory and the water encountered in excavation has been reduced 75 per cent. The remainder of the grout holes will be grouted under high pressure when sinking has been finished, after which the shafts will be filled with concrete.

Foundation Treatment—Excavation in streambed over the foundation area revealed sound rock walls about 90 ft. apart at the upstream toe and 50 ft. apart at the downstream edge of the structure. Between these walls, as previously described, the rock was faulted, broken and unsuited for the support of the four buttresses which would bear entirely or in part on this area. With a spacing of 22 ft., two buttresses at least would extend over the main fault and the others would rest on rock of uneven strength. Excavation in the cutoff indicated that conditions could not be bettered by going deeper. The

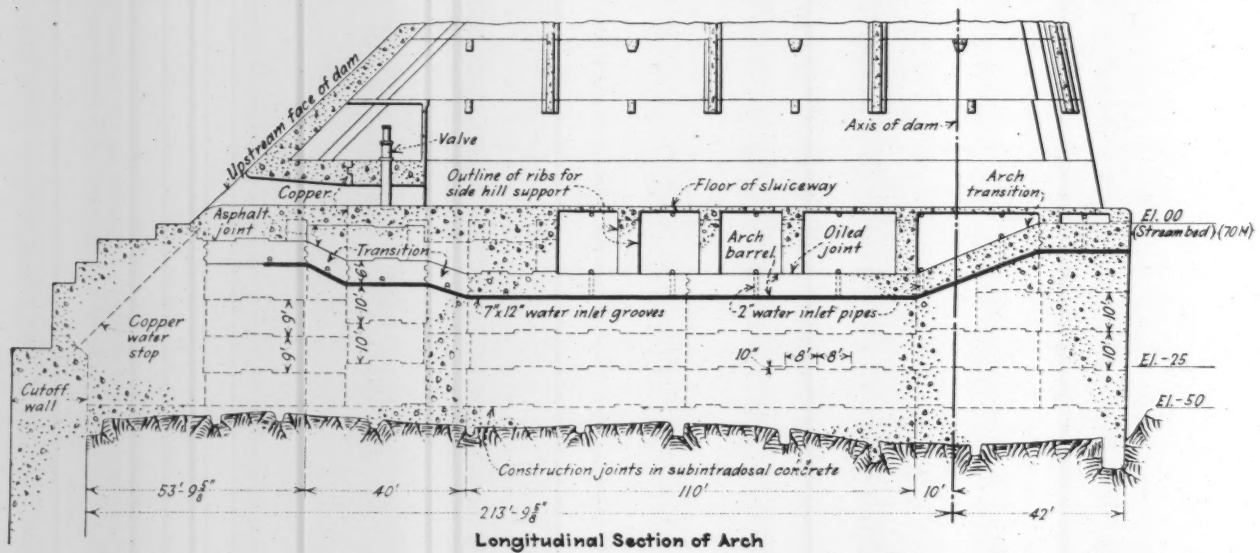
FIG. 2—GENERAL VIEW OF FOUNDATION WORK
Shafts in cutoff wall shown in foreground. Arch completed and foundation ready for buttresses.

alternative was to provide a foundation structure across streambed to equalize that portion of the load which could be carried by the weaker rock and transfer the remainder to the sound rock of the walls.

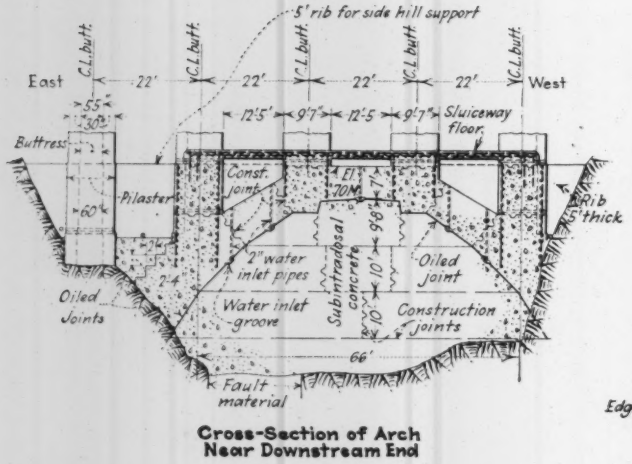
The first plan consisted of providing a horizontal layer of reinforced concrete 8 ft. thick over the entire streambed to equalize the loads to be placed on this area. Upon this floor the design provided heavily reinforced-concrete ribs 5 ft. thick at 20-ft. spacing extending between the sound rock of the side walls. The main buttress loads were to be carried by the arch action of these ribs, suitably reinforced, to the rock of the sides. Modification of this plan, approved by a consulting board, consisted of providing an arch of concrete voussoirs spanning streambed and extending continuously from cutoff to the downstream end of the buttresses. Further, the plan provided that the space between the foundation rock and the intrados of the arch should be built up of lean concrete to provide a support for constructing the arch and to transmit a portion of the load vertically.

Arch Design—The arch span at the intradosal springing line varies from 86 ft. at cutoff to 76 ft. at the downstream end of the structure. This decrease in span has the advantage of providing a wedge action which increases the resistance to sliding and, in addition, places the heaviest buttress loads over the shortest span. Arch rise varies from 28.2 ft. at cutoff to 32 ft. at the other end of the 225-ft. length of arch barrel. The changes in arch dimensions require several transition sections, as shown in the accompanying longitudinal section. Maximum thickness is 7 ft. at the crown and 12 ft. at the haunch; corresponding minimum thicknesses are 6 and 10 ft.

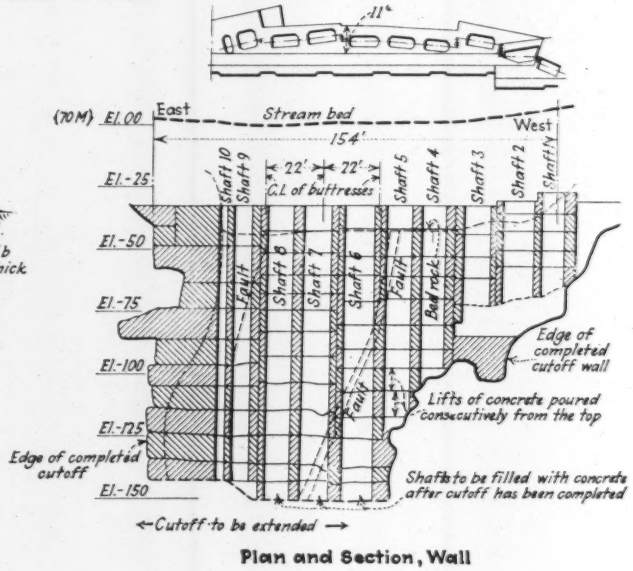
The arch barrel is designed to carry the entire load of the four buttresses to the sound rock of the sides, no allowance being made for the portion of load that will be transmitted vertically by the sub-intradosal concrete. This provision would permit the loss of the supporting concrete either through washout or settlement without damage to the superstructure. The provisions of this special foundation design are intended to equalize and transmit to the rock in streambed such portion of the load as it will carry and, in event of the loss of this sup-



Longitudinal Section of Arch



Cross-Section of Arch Near Downstream End



Plan and Section, Wall

FIG. 3—SECTIONS OF CUTOFF WALL AND ARCHED FOUNDATION, RODRIGUEZ DAM

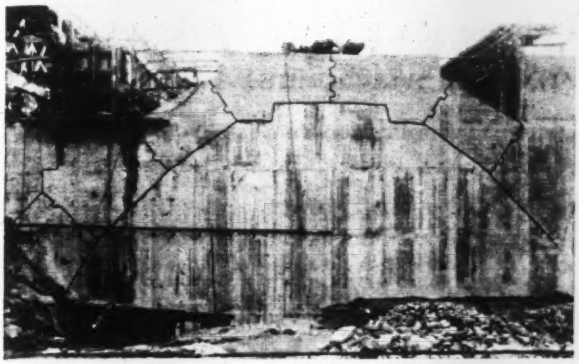


FIG. 4—DOWNSTREAM END OF FOUNDATION ARCH
Two buttresses will rise on the crown voussoirs as indicated by reinforcing. Joints in arch emphasized by paint lines.

port, to transfer the remainder or the entire load by arch action to the sound rock of the side walls.

All stresses in the arch are compression and the allowable design maximum was 700 lb. per square inch. This value is higher than the unit-stress limit in other parts of the structure but was considered justifiable because of the emergency nature of such extreme stresses. For symmetrical loading the crown of the arch was placed halfway between two buttresses. Final arch computations, including rib shortening and shear distortion, proved the entire arch to be in compression and no bending reinforcement was used. However, heavy reinforcing parallel to and directly under each buttress provides for any lateral bending in the arch.

The connection to form a transition between the comparatively flexible arch barrel and the practically rigid cutoff wall was a difficult problem. The solution consisted of pouring a large block of concrete overlapping the cutoff and facing the upstream end of the arch barrel. Possible bending moments in the bottom of this mass are taken by heavy layers of steel. Also, layers of steel were placed both in the intrados and the extrados of the section of arch barrel adjacent to this concrete block and extended into it to carry arch action from the barrel into the block.

Arch Construction—The first step in foundation construction was the pouring of a 2-ft. mat of concrete over the entire area which had been trenched with 3-ft. grooves at right angles to the stream. On this mat 10,500 cu.yd. of sub-intradosal concrete was poured in the form of interlocking blocks separated by ordinary construction joints. The upper surface of these blocks was built to form the intrados of the arch and the joint oiled. The keyed surface of this sub-intradosal concrete is shown in the accompanying illustration. Pouring the voussoirs of the arch followed, the upper surface being built up to form footings for the buttresses.

The possibility exists that at time of high flood, backwater might rise 15 ft. or more over the arch, which would add a material increment of load to the maximum buttress load then existing on the arch. To provide against this load increase, inlet grooves were placed at five locations on the under side of the arch barrel, connected by pipes to the upper side. The grooves (see section of arch) were filled with precast blocks made of porous mortar as an improvement over gravel filling, which was difficult to retain in place. This provision will permit any backwater pressure to equalize on both sides of the arch as it forms.

Immediately above the arch, concrete ribs 5 ft. thick on 20-ft. centers extend between the rock walls up to streambed level. These ribs are integral with the lower part of the buttresses, dividing the structure at this elevation into practically square cells (Fig. 3). The purpose of these transverse struts is to give support to the lower canyon walls against the possibility of the rock sliding on the cleavage planes.

Concrete Control—Concrete strengths adopted were 2,000 lb. for the arch and bracing walls and 1,200 lb. for the sub-intrados at 28 days. Proportioning for the 2,000-lb. concrete started with a water content of 1.00 and eight sacks to the 1.6-cu.yd. batch. Tests proved that the strength secured was above requirements; the water content was increased to 1.08 and the cement cut to seven sacks without affecting workability. The 1,200-lb. concrete for the sub-intrados was proportioned with a water content of 1.25 and six sacks of cement. Later the cement was reduced to 5½ sacks without changing the water content. Actual 28-day test shows the concrete designed for 1,200 lb. averages about 1,500 lb. and the 2,000-lb. concrete has an average strength of about 2,650 lb. The coarse aggregate includes three sizes up to 6-in. cobbles.

Construction Methods—Five cableways of about 1,000-ft. span comprise the major equipment in use. The two largest with 165-ft. towers are electrically operated and have a capacity of 12 tons each. Three smaller ones are air-operated. Transporting of lumber, concrete, forms and excavated material is done almost entirely by these cableways.

A railroad within half a mile of the site made transportation problems negligible. Power is supplied by a 12,000-volt transmission line about 10 miles long to the

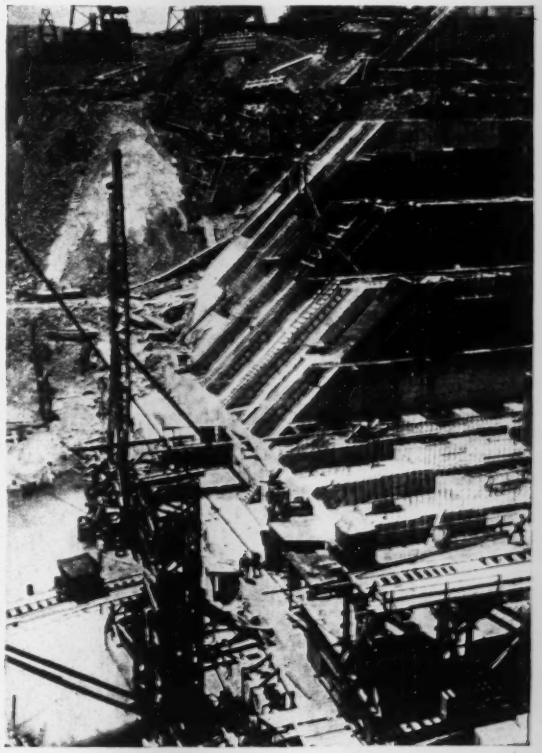


FIG. 5—LOOKING WEST ALONG CUTOFF WALL
Timber headframe in foreground and the steel derrick used in shaft excavation.

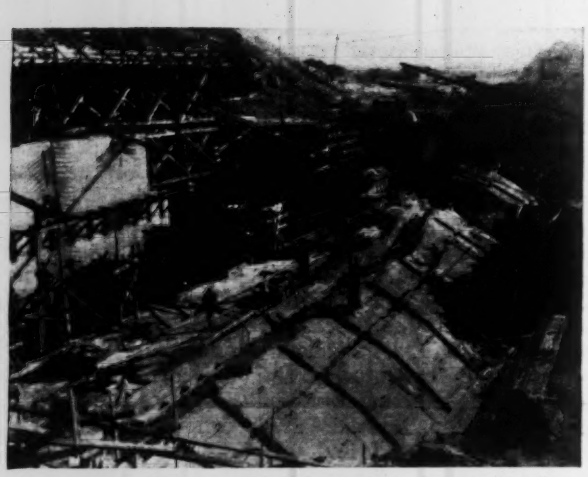


FIG. 6—COMPLETED SUB-INTRADOSAL CONCRETE BEFORE POURING ARCH
Note longitudinal water inlet grooves and pipes for uplift investigations.

main compressor plant and the camp and for general construction use.

An aggregate washing and batching plant of 500-cu.yd. capacity in eight hours is located immediately downstream from the dam. The material is dragged to the plant by cableway excavator, much of it coming from the gravel dumps resulting from the 125,000 cu.yd. of foundation excavation which was carried on by power shovel and trucks. Concrete is batched by volume and mixed in two 1½-yd. mixers. The batches are hauled by gasoline locomotives and placed directly by chute or transferred by cableway to the point of pour. About 95,000 cu.yd. of concrete has been poured and the estimated total yardage in the structure is 190,000.

Contract—The contract with the Northern District of Baja California for the design and construction of Rodríguez Dam is held by the Ambursen Dam Co., of New York and San Francisco. Plans and construction are subject to the approval of the Mexican government. A provision of the contract calls for the employment of 80 per cent Mexican labor. All expenditures must conform to a monthly rate of payment which originally was about $120,000 but since January, 1930, has been only $60,000 per month. The crew, under the present money allotment, averages about 250 men, although a maximum of 450 has been employed. Common labor wage is $2.25.

Personnel—The national government of Mexico and the Northern District of Baja California are co-operating in carrying out this development. The project was conceived and undertaken by Gen. Abelardo L. Rodríguez, who was for five years governor of Baja California, and whose name was given to the project by former President P. E. Calles. Gen. Arturo Bernál is now governor of the district, being represented by Roberto B. Martínez, chief of the public works department of the district. Sr. Ignacio López Bancalari is chief executive of the national commission of irrigation and is represented in the district and on the Rodriguez project by Sr. Jose L. Favela. Charles P. Williams, Los Angeles, is consulting engineer for the national commission. A. J. Wiley and F. A. Noetzli with Mr. Williams have acted as a consulting board on problems of foundation and design. The Ambursen Dam Co. is represented on the site by H. J. Hoard, superintendent, and S. E. Rockwell, resident engineer, H. M. Nabstedt, vice-president of the company at San Francisco, being in general charge.

Caliche Rock Used as Aggregate in Macadam Paving

Hot Oil Application on Base Provides Bond for Inverted Penetration Macadam Surface

THE city of Amarillo, Tex., has developed a new type of penetration macadam paving, using native caliche rock as aggregate and laid on an oiled base by the inverted method. Applicable to old macadam, gravel, earth or new earth streets, the paving, now known throughout the Panhandle as the Amarillo type, is proving to be a cheap and satisfactory street surfacing for local climatic and traffic conditions. The use of native caliche limestone rock for macadam aggregate has long been thought inadvisable because of its softness, but actual road tests are now proving it to be a satisfactory material. Gravel is somewhat scarce in the Panhandle, whereas caliche rock is to be found almost everywhere. Previously caliche rock was often removed and replaced with gravel to provide a road surface.

Oiling the base makes a great difference in the life of the surface. The oil waterproofs the base and provides a bond for the macadam asphalt. Streets in Amarillo have been surfaced with identical materials and by the same methods on both oiled and unoiled bases. The macadam on subgrades where the oiling process was omitted was found to ravel and peel off in places in a short time, creating holes in the surface. Oiling the base seems to have eliminated this trouble.

The first step in surfacing by the Amarillo method is to build monolithic curb and gutters where not already provided, the gutters being 7 in. thick. On new or earth streets the roadway is excavated to the bottom of the curb and 9 to 9½ in. of 2-in. caliche rock is placed as a base course, wetted and thoroughly rolled. Then 0.3 to 0.35 gal. per square yard of No. 55 road oil is applied under pressure and at 300 deg. temperature. After being barricaded for 24 hours, the street is opened to traffic for two to three weeks. Inherent soft spots in the subgrade are revealed during this period and can be remedied.

The penetration macadam surface is placed by the inverted method. Asphalt at the rate of 0.3 gal. per square yard is spread upon the oiled base. Then a layer of 1-in. caliche stone is placed by spreader trucks, 1 cu.yd. of stone covering 35 sq.yd. of roadway. This stone layer is lightly rolled by a 5-ton roller. Next No. 250 asphalt is applied at the rate of 0.6 gal. per square yard, followed by a layer of ¾-in. stone, 1 cu.yd. to 60 sq.yd. of surface. A roller passes over this layer until all of the stone has been rolled into place. The surface is then dusted, given a final rolling and opened to traffic.

In resurfacing old waterbound macadam streets, where sufficient gravel exists to form a base for the new surface, the material is reshaped with blades, but not scarified. Where insufficient gravel exists to form a satisfactory base, the difference is made up with 2-in. caliche stone. Hot oil, 0.3 gal. per square yard, is then applied to the base, and the street opened to traffic for two or three weeks. Then the inverted macadam surface is placed in the same manner as described above.

The Amarillo type of macadam surfacing was developed by E. H. Stanley, city engineer of Amarillo. Present costs of this type of paving are averaging $1.14 per square yard in Amarillo.

Automatically Controlled Electric-Driven Pumps Keep Sewage Out of Lynn Harbor

Variations in Sewage Flow and Tide Level Met in Pumping Plant of 90,000,000-Gal. Daily Capacity by Throwing Pumps In or Out by Float Switches and by Motor-Speed Control Regulators

By Myron G. Mansfield

Secretary, Morris Knowles, Inc., Consulting Engineers, Pittsburgh, Pa.

As a part of extensive harbor improvements at Lynn, Mass., a 60-in. cast-iron outfall sewer was built to carry the sewage of the city to deep water nearly three miles from the shore. This necessitated pumping highly variable amounts of sewage under heads changing with the tide. Six electric-driven centrifugal pumps are used for this purpose, thrown in or out automatically as the flow varies. Motor speed is varied automatically to meet changes in head due to tidal fluctuations. The pumping equipment and its housing is described in this article. The outfall sewer, tidal-flat reclamation work and the relation of the sewer to the federal ship channel, and also proposed enlargement of the latter, were described by the present writer in *Engineering News-Record*, Sept. 4, 1930, p. . . . .

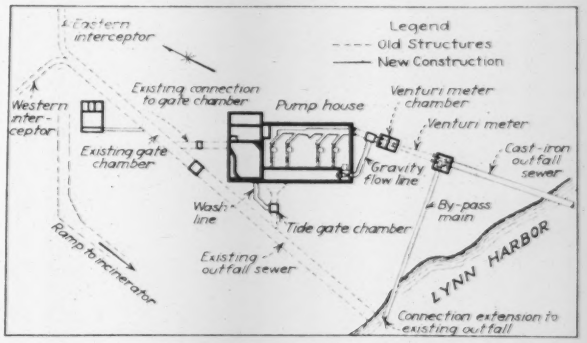
Pumping Station—The pumping station was constructed on city property adjacent to the works of the Lynn Gas & Electric Co. near the outlet of the section of outfall sewer constructed in 1920. The station is approximately 107 ft. long by 53 ft. wide, having a reinforced-concrete substructure and a brick superstructure. It consists of screen and grit chamber, a suction chamber, a pump pit, and boiler room below ground level; motor-operating floor, electrical room, office and workroom, and screen-operating room above. In addition, coal storage, sluice-gate chambers, tide-gate chamber, overflow weir, venturi meter and valve chambers were provided.

The sewage is intercepted at the inlet connection constructed in the section of outfall sewer built in 1920. Thence it is conveyed to a small grit chamber, whence it passes through a screen chamber into the suction well adjacent to the pump room. The screening equipment consists of two sets of duplicate bar screens with baskets, raised and lowered for cleaning by means of electric motors, provision being made for having one screen always in place while the other is being cleaned. From the suction chamber sewage is pumped through a venturi meter into the 60-in. cast-iron outfall sewer and thus conveyed to the outlet in deep water.

Provision has been made for an overflow weir to carry off excess drainage water at times of heavy rainfall, with a concrete flume connecting to an outlet branch previously constructed in the existing outfall sewer. A tide gate was provided in this flume to prevent tide water from running back into the suction well. A 30-in. wash-water line with connection on the harbor side of the tide gate, to permit flushing of the outfall sewer when desired, and a gravity flow line, so that pumps do not have to be operated at times of low flow and low tide, were also provided. A 36-in. cast-iron bypass main was constructed between the old and new outfall sewers, so that the entire capacity of the two intercepting sewers may be pumped.

An automatic bypass valve has been set on this line, so the maximum head for which the 60-in. cast-iron outfall sewer is designed will be reached and maintained before any sewage is discharged through the emergency outlet. In this way the maximum quantity of sewage is pumped through the 60-in. outfall sewer at all conditions of tide.

The old outfall sewer was extended seaward approximately 1,400 ft. to the state harbor line by means of 60-in. cast-iron pipe constructed like the main outfall sewer. Primarily, this extension serves as a storm-water relief sewer when the flow is too great to be carried by the new three-mile outfall. The extension will also serve as an emergency outfall in case of a shutdown in either the pumping station or the new outfall. The extension discharges outside the new bulkhead.



LOCATION MAP OF SEWAGE-PUMPING STATION, LYNN, MASS.

The station is located near the junction of two intercepting sewers. The pumps discharge through a new ocean outfall sewer. Excess stormflow goes to the harbor through a relief outfall, which also carries the normal flow in case of a shutdown of the new ocean outfall.

The experience with the new outfall, as regards sewage dispersion has been satisfactory throughout some two years of use. Evidence of sewage vanishes within a radius of 200 to 300 ft. of the outfall.

Construction Methods—Construction of the pumping station required the excavation of an open rectangular pit about 30 ft. deep and 6,000 sq.ft. in area. The upper strata consisted of a miscellaneous fill from top surface at El. +18 to El. +4. From El. +4 to —26, there was a deposit of very fine uniform sand with thin layers of bluish silty clay. At El. —26, the sand rested on top of a bed of soft blue clay of unknown depth.

The shortest distance between the station and shoreline of Lynn harbor at the time of construction was about 100 ft. and the shortest distance between the building and municipal incinerator was some 56 ft. The incinerator plant rests on piles not more than about 15 ft. long with tops at El. +8. The bottom of the excavation of the pit for pumping-station substructure was at El. —12, and therefore it was necessary to provide adequate protection for the incinerator building. To lay the entire

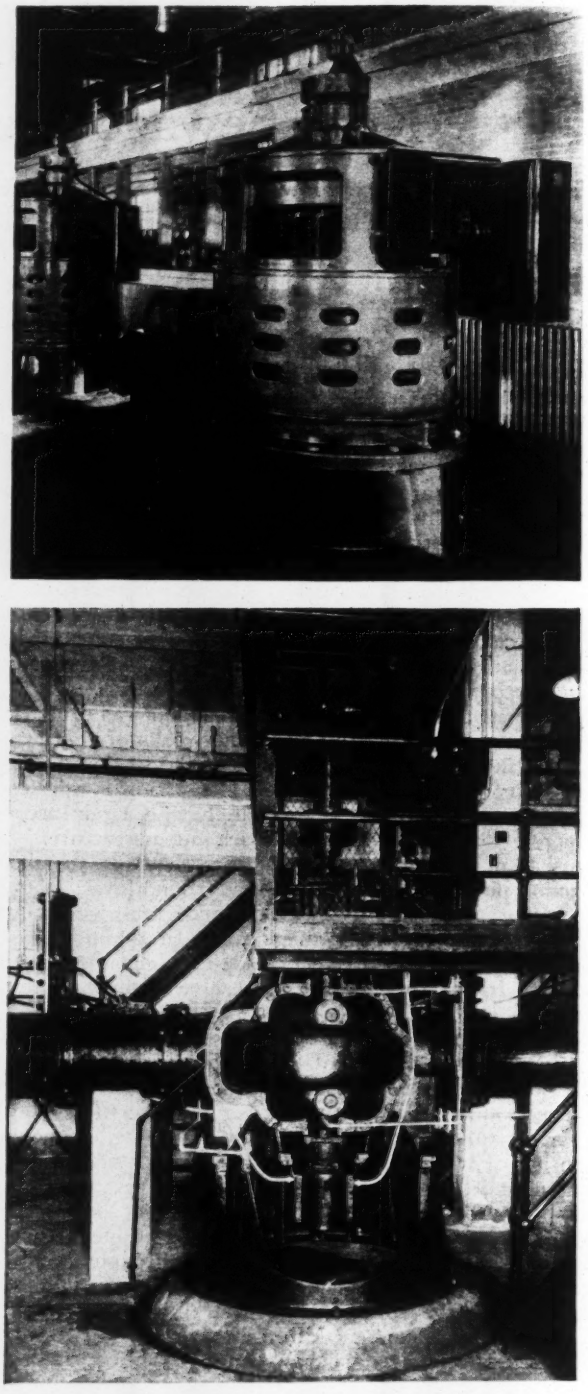
length of outfall sewer with water equipment, a channel was dredged to within 40 ft. of the pumping-station excavation.

The excavation was made by the well-point method. The fill from El. +18 to El. +4 was first excavated with almost vertical slopes and without any timbering. Close to the foot of the slope, well points 12 ft. long, 2 ft. on centers, were jetted into the ground, their lower ends being at El. —8±. The wells consisted of 1½-in. steel pipe were provided with well points. The last 2 ft. of each well was provided with brass mesh to prevent fine soil particles from entering the pipe and clogging the wells. The wells were connected by means of short sections of rubber hose to a 6-in. manifold completely surrounding the pit.

From the manifold the water was discharged by a 5-in. motor-driven centrifugal pump, located at about the same level as the manifold, into a small wooden flume leading to the harbor. A second pumping unit of the same type served as a reserve in case of a breakdown of the first one. As a result of pumping from the first set of wells, the groundwater level was lowered to about El. —4 or —5, and the fine sand became firm and stable enough so that excavation could be carried out without any hindrance. The strata stood unsupported at a slope of ½ to 1.

After excavating to El. —2, a second set of wells, similar to the first, was jetted into the ground, with the lower ends of the strainers at El. —14 to —16. After draining the sand by means of the second set of well points, excavation was continued to about El. —9. At this level water accumulated in the bottom of the pit, indicating the presence of a continuous, rather impermeable layer, separating from each other the spaces drained by the first and second set of wells. To remedy this condition a 3x5-ft. well was sunk in the southeast corner of the pit with its bottom at El. —19. This was constructed by driving steel sheet piles into the ground completely around the site selected for the pit and then excavating the material within the enclosure. A lining which just fitted the inside of the sheet-pile enclosure was made out of No. 4 mesh galvanized-wire fabric, stretched over a tight frame and lowered into the excavation. The empty space was then filled with pea gravel, serving as a filter, and the sheet piles pulled. By draining the water from the bottom of the excavation into the pit and removing it with a centrifugal pump, the surface was kept sufficiently dry for finishing the excavation. The amount of drainage water, with complete drainage works in operation, averaged from 150 to 200 g.p.m.

Although the material stood at a slope of 1.2 to 1 in the second step of the excavation, local cave-ins occurred due to seepage water percolating out of the slope between the layers and seams of clay. This made it necessary to protect the lower part of the slope by means of wood sheet piles 5 ft. long, driven to a depth of about 1 ft. below finished grade. A 6-in. tile drain was laid outside the building line around the edge of the excavation with a connection across the bottom into the drainage well. This drain was placed below the final subgrade and covered with a 9-in. layer of gravel. As the lower end of the second set of well points was at a depth of not more than 2 to 4 ft. below grade, no open excavation for the drain could be made at the bottom of the pit without fine sand starting to flow. Therefore, for placing the tile, a rectangular steel frame was used, serving as a shallow, movable open caisson. Under the protection of this caisson, placing of the drain was carried out section by section, the frame being picked up and moved forward to a new section as soon as the preceding one was placed. As a result of the combined effect of the wells, the drainage well and the surface drain, the underground remained practically undisturbed.



MOTOR AND PUMP AT LYNN SEWAGE-PUMPING STATION

Motor above, pump below, direct-connected. One of the other five motors is partly shown at left in upper view.

Four loading tests of the relative resistance of the materials were made, using hydraulic plunger jacks bearing against a load of 10 tons, resting on top of a rough platform. The loaded area was equal to 1 sq.ft. One test was made in a rectangular pit about

3x4 ft. and 4 ft. deep, the pressure acting in a horizontal direction against the smooth vertical walls of the test pit. The result of this test was practically the same as that of the test performed by exerting a vertical pressure on a horizontal surface of the same area. It was found that at El. —12 the quicksand was exceedingly firm, a load of five tons producing a compression of about $\frac{3}{16}$ in. At El. —2, the same load produced a compression of somewhat more than $\frac{1}{2}$ in.

Because of the nature of the strata, a layer of soil from 4 to 6 ft. thick was practically out of direct communication with the strainers at both the upper and lower sets of well points. This necessitated the construction of auxiliary drainage systems within the excavated area and the driving of a row of short sheet piles to prevent caving. In spite of the quicksand character of the material, there was no general movement whatever within or beyond the proposed building line and the sand fully retained its original density and resistance against compression.

The floor, 4 ft. in thickness, with girder reinforcement, was poured in four sections. Walls were poured with horizontal joints at El. +4.5 and 14.25, the latter elevation being at the under side of girders. Water stops of copper were placed at all horizontal and vertical joints below El. +14.5. Vertical steel was placed in single lengths extending from El. 17.5 to —11.5.

Equipment in Pump House—The pumping equipment consists of four motor-driven vertical centrifugal units, two having a capacity of 15 m.g.d. and two a capacity of 30 m.g.d.—a total of 90 m.g.d. The pumps are located in a specially constructed pump room at El. —8, below the normal level of the sewage in the suction well, and therefore are always primed. Motors are located on the operating floor at El. +18, or ground surface, the motors and pumps being connected by vertical shafts approximately 15 ft. long with two steady bearings for each shaft. The two 24-in. pumps have non-clogging type impellers with clear openings of $4\frac{1}{4}$x$4\frac{1}{2}$ in. The two 30-in. units have impellers of the inclosed type with $3\frac{1}{2}$x$3\frac{1}{2}$-in. clear openings.

Motors and control equipment were special in design and arrangement. The main equipment consisted of two 140- and two 275-hp. vertical, alternating-current, variable-speed, brush-shifting motors. Motors driving pumping units are controlled either automatically or manually by push-button stations with all switchboard and control equipment located in a separate room adjacent to the motor-operating room. The quantity of sewage pumped varies from about $7\frac{1}{2}$ to 100 m.g.d. The pumping head varies continuously, due to tide elevations, from 0 to 14 ft., and the friction head in the 60-in. outfall sewer varies at the different pumping rates. Therefore, automatic equipment was provided so that maximum economy in the use of power could be secured for all conditions of operation.

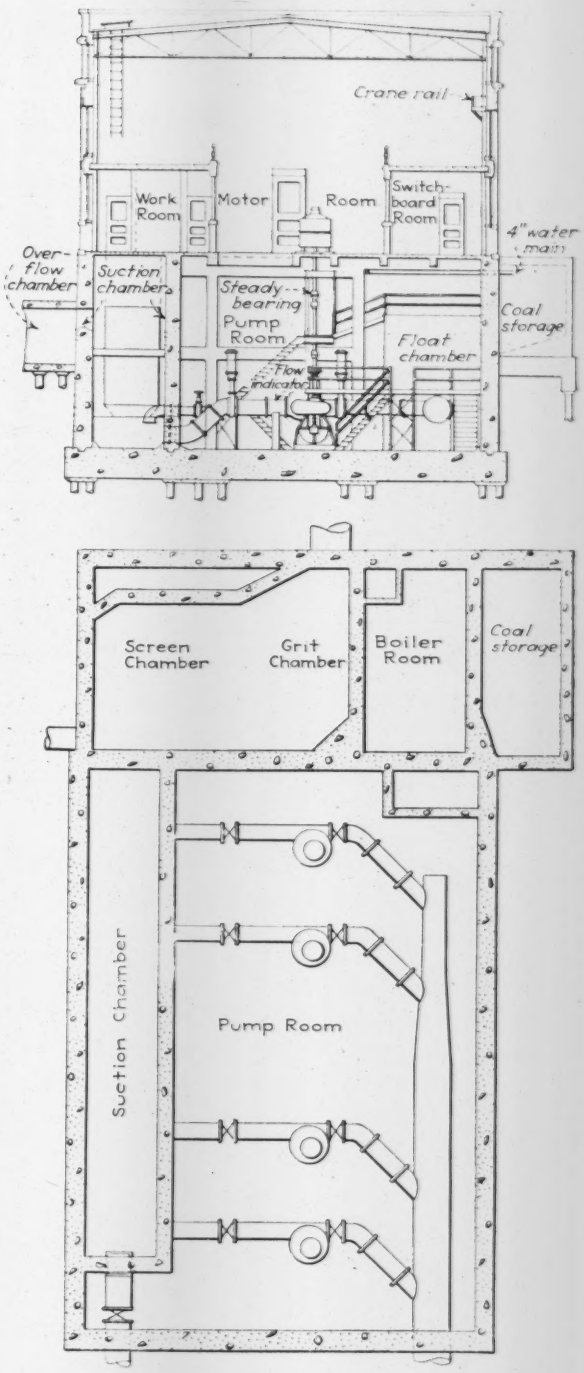
The motors are started and stopped by six float switches, the floats of which are placed at various levels in a float chamber connected to the suction well. The operating sequence is as follows, the numbers referring to float switches:

No. 1 closing, starts a 140-hp. motor.
No. 2 closing, starts a 275-hp. motor and stops the 140-hp. motor.
No. 3 closing, again starts the first 140-hp. motor.
No. 4 closing, starts another 275-hp. motor and stops the 140-hp. motor, leaving two 275-hp. motors running.
No. 5 closing, again starts a 140-hp. motor.
No. 6 closing, starts the remaining 140-hp. motor, leaving all motors running.

The stops on the floats are so arranged that when all motors are running the last motor started will not be shut down until an appreciable reduction in elevation is made of the sewage in the suction well, thus preventing too frequent starting and stopping during storm conditions.

Sequences of starting and stopping differing from the above may be established by coupling devices mounted in the rear of the control panel so that the float switches can control different motors if desired.

Speed control of the motors is obtained by a specially adjusted regulator with two diaphragms, one con-



PLAN AND SECTION OF LYNN SEWAGE-PUMPING STATION

nected to the outfall sewer and the other to a float chamber. The controls are designed for thirteen speeds, varying from 140 to 500 r.p.m. for the 140-hp. motors, and from 150 to 360 r.p.m. for the 275-hp. motors. The regulator located on the pump room floor is connected to a master control switch in the control room above by means of a vertical rod which rotates it through thirteen points corresponding to the thirteen speeds. When the first float switch closes, the range of the regulator connected to the suction well calls for the eighth speed and gradually reduces the speed one point every 6 in. of water in the suction well.

The purpose of this regulator is to maintain the water level in the sewers at normal elevation. The regulator connected to the outfall sewer has no influence at low tide and low flow conditions. If the speed were controlled only by the regulator connected to the outfall sewer, the water level on the suction side during low tide would have a tendency to rise, owing to the slow speed of the pumps. This rise in level would operate the float switches of more than one motor while the actual flow could be better handled by a single motor operating at a higher speed. With stormflows or high tide, or both, the total head is increased sufficiently to transfer the speed control from the suction diaphragm to the discharge diaphragm. Special consideration has been given to the operation of the speed control so that there is a definite interval between speed changes from one point to the other, thus permitting the pumps to accelerate the column of water in the discharge line.

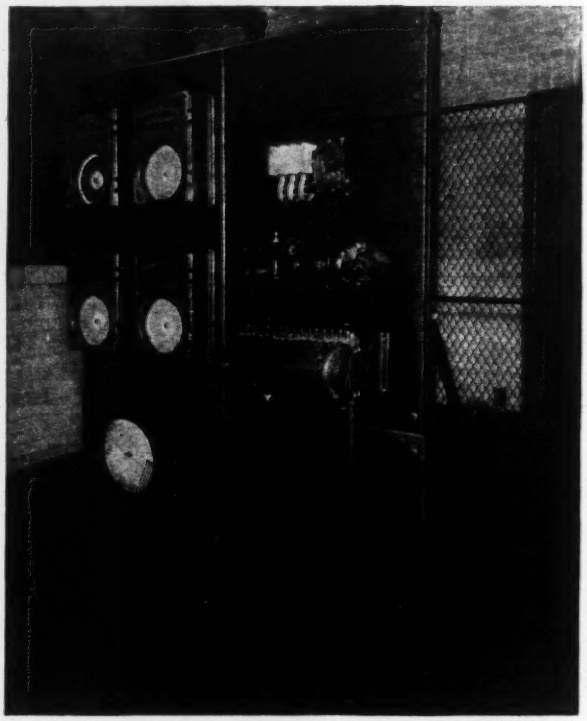
The discharge valve on each unit is operated by a solenoid hydraulic piston, so that the valve commences to open as soon as the pump is started. When a float switch operates to shut down a motor, it first starts to close the valve; when nearly closed, the motor stops. This arrangement tends to prevent water hammer in the long outfall line, which would often result from starting and stopping the pumps.

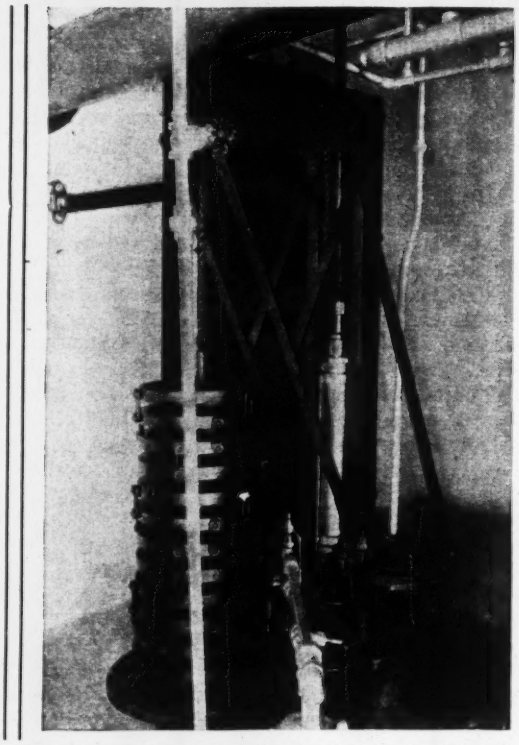
As the station is fully automatic, provisions have been made to shut down a motor with failure of the discharge valve to open, with no flow, or with reverse flow. The motors each operate on two different windings—the "Y" connection of the primary being established up to a little past the ninth speed. When this speed is reached the delta connections are established up to the thirteenth and last speed.

Each pumping unit with its electrical control is amply protected against overload. If such a condition should exist for any reason, and the unit should be shut down, it cannot be automatically started. This gives an attendant an opportunity to investigate the reason for the trouble. If the voltage fails, the unit or units will be brought to complete rest but will start again upon return of the voltage. Each motor also has overspeed protection which will automatically shut down the unit.

The incoming voltage to the station is 13,200, brought to 333-kva., 13,200/220/440-volt, and one 10-kva., 13,200/110/220-volt, single-phase, self-cooled transformers. The operating current for the main apparatus is 440 volts, 60-cycle, three-phase. The substation is built on the outside of the building, low voltages only going into the main pumping station.

The entire equipment is electrically operated, power being furnished by the Lynn Gas & Electric Co., whose central station is adjacent to the pumping station. Provision has been made in the electrical equipment to prevent possible explosion of sewage gases which may collect.





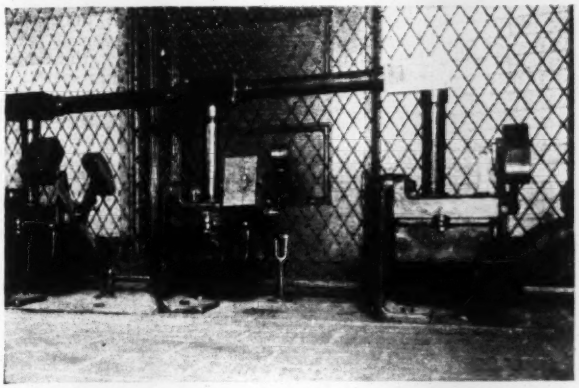
MOTOR-SPEED CONTROL APPARATUS AT LYNN SEWAGE-PUMPING STATION

Below: Hydraulic regulator which increases or decreases motor speed according to variations in pressure head, due to changes in the tide level. Above: master switch operated by rod extending upward from regulator.

Operation—The pumping station was started under normal operation about July 1, 1928, and pumped at rates varying from approximately 7½ to 110 m.g.d., the latter quantity for periods of short duration.

The total quantity of sanitary sewage and stormwater pumped during the year 1929 was approximately 5,200 m.g. or an average rate of approximately 14.2 m.g.d. April was the month of maximum pumpage with an average rate of 23.2 m.g.d.

Pumping equipment and control apparatus has been designed to maintain approximately low tide conditions at the pumping station, so that the maximum capacity of intercepting sewers can be realized. At times of low tide and low flow, pumping equipment will automatically shut down and permit gravity discharge. The control float for the first unit is set to start operation at El. +4½ ft. Therefore, gravity flow will take place until the head in the outfall sewers equals this elevation. Control floats for the other three units are set to start operation when



FLOAT SWITCHES GOVERN NUMBER OF PUMPS IN USE

the level of the sewage in the suction well reached +5. +5½ and +6 ft. respectively. Speed-regulation control has been provided so that pumping units, as soon as they are started, will speed up sufficiently to draw the level of the sewage in the suction well down to approximately 0, or mean low tide, decreasing in speed so as to maintain this level. Float gages are set to shut down the various units when the well reaches El. —1 to —1½.

Although the sewage is only coarsely screened, very little trouble has been experienced with the pumps clogging. The station is in charge of an experienced electrical engineer with a normal operating force of two men on each shift, in addition to the chief engineer and general repairman.

The pumping station and equipment cost $454,000: motors, pumps and accessories, $108,600; pipe and specials, $19,700; valves, $10,600; building and pump well, $315,000, of which $181,000 was for the substructure and $134,100 for the superstructure. The substructure was built by the Tunnel Construction Co., New York City, and the superstructure by the William T. Dinneen Construction Co., Lynn, Mass. The special motor and control equipment was designed and supplied by the General Electric Co.

Cost of Grade-Crossing Elimination

Railroads of the United States in 1929 spent $28,445,680 for the protection or elimination of highway grade crossings. Of that amount $25,113,338 was spent for separation of grades and $589,941 for abandonment or removal of highway grade crossings. For automatic warning devices, gates, signals and signs designed to protect human life at crossings, $2,742,401 was expended.

An Early Chapter in the History of Water Filtration

Before Designing London Filters Built a Century Ago James Simpson Built Two Test Plants and Traveled 2,000 Miles

IT HAS generally been accepted that the earliest slow sand filters were those put into operation a century ago by the Chelsea Waterworks Co. to supply a portion of what is now Greater London. Now and then reference is made to still earlier filters, generally at Glasgow, as mentioned on p. 499 of *Engineering News-Record* for Sept. 26, 1929. In view of these facts and of recent conflicting statements regarding the year the Chelsea filters went into operation, the following extract from a letter addressed to *Engineering News-Record* by Charles F. Marsh, deputy chief engineer Metropolitan Water Board, London, England, is of interest:

> An experimental filter was installed by James Simpson at Chelsea water-works, near Grosvenor Road, Pimlico, in 1827, after he had seen several large filters at work in Manchester and Glasgow, and in December of that year he put forward working drawings and specifications for the proposed filter beds for Chelsea Waterworks Co.
>
> It appears that weather conditions delayed the work of construction, but the filter beds were put into operation in January, 1829, and proved to be perfectly satisfactory.
>
> I believe that the filtration works at Manchester and Glasgow were really infiltration galleries in the gravels and sands adjacent to the rivers and were not artificial slow sand filters.

First Filters Used From 1829 to 1856

The filters that went into operation in 1829 were abandoned in 1856, on the completion of another filtration plant, as stated in more detail by Mr. Marsh, as follows:

> The Chelsea Waterworks Co. obtained an act in 1852 to remove its intake to Surbiton. The filter beds and other works authorized by that act were completed and brought into use in the year 1856, when the original filters at Pimlico were abandoned. The land on which the original filters and reservoirs were constructed was situated between the Grosvenor Canal and Turnentine Lane (now Peabody Ave.). A portion of this land was sold in 1860 to the Victoria Station & Pimlico Railway Co. The land upon which the filters themselves were constructed was sold in 1866.

Further researches by Mr. Marsh, after he wrote his first communication on the London filters, disclosed a rich mine of contemporary information about Mr. Simpson's filter investigations, designs and the resulting construction, from 1825 to 1829. It now appears that this pioneer filtration engineer visited many places besides Manchester and Glasgow, traveling some 2,000 miles for the purpose and inspecting "filter beds" which had given satisfaction for working periods of "from four months to sixteen years." Mr. Marsh found this and other interesting information, in "Hydraulia: An historical and descriptive account of the waterworks of London and the contrivances for supplying other great cities in different ages and countries," written by William Matthews and published in 1835. Mr. Marsh's transcript from the book, which closes with a quite detailed description of the first Chelsea or London filter bed, about an acre in area, follows (center headings inserted and some of the original long paragraphs broken up):

Contemporary Notes on First London Filters

> The Chelsea Water Works are situate at the northeast part of Chelsea Reach, on the bank of the River Thames, whence the whole of the water is procured. At this place the company

possesses several acres of freehold land, well adapted for their purposes; and at a short distance from the river is erected an engine-house, containing the two steam engines which are employed to pump the water into the reservoirs. Formerly, many of the houses received their supply of water directly from the river, without its being allowed to stand for the deposition of any extraneous matters that may be mixed with it when in an agitated state, but as this practice occasioned complaints about its condition, it led to the adoption of a great improvement, and the water now passes through the process of filtration, to render it clear before the tenants are supplied. As this operation effectually separates from the water all those substances which occasion its turbid appearance when first drawn from the river, its transparency and taste at the works are equal to that of the finest springs.

To deprive the water of all casual impurities, as well as to clarify it completely, previous to its passing from the reservoirs to the cisterns, became not only desirable but indispensable, to obviate the dissatisfaction at its turbidness, when taken and conveyed directly from the Thames; and the same objections equally apply to that of any other river, especially after rains or floods.

Experiments and Inspection Trips

During the years 1825 and 1826, Mr. Simpson, the engineer to the company, made a variety of experiments on the subject of filtration; and the directors having determined that all the water supplied from the works should be subjected to the process, in January, 1827, they allowed him to make some experiments on a much larger scale than any of his prior attempts, and at the same time urged him to direct his whole attention to the object. In fact, so great was their anxiety to have the plan rendered perfectly effective, that they ordered him to visit Glasgow, and various other places in Scotland, Lancashire, and Lincolnshire, to examine the different methods employed for filtering water. This injunction induced him to travel about 2,000 miles, and in the course of his peregrination, he had opportunities of inspecting filter-beds which had proved completely efficient for different periods of time, varying from four months to sixteen years.

Having, however, contrived the plan of a filter-bed before he left home to proceed on his journey, he directed a model of it to be constructed at Chelsea, of such dimensions that the filtering reservoir should comprise a space that allowed a surface of forty-four feet square at the top of the basin, and with its sloping sides would contain thirty-two feet square of sand, or about 1,000 feet altogether.

Company Directors Order Filters Constructed

Soon after Mr. Simpson's return from inspecting the various filter-beds at other places, he made a trial of that which had been constructed by his own direction, and its successful action during more than six weeks impelled him to make a report of its satisfactory results to the directors, who accordingly ordered the construction of another of considerable magnitude, and adapted to clarify all the water requisite for supplying the whole of the company's tenants. This was subsequently constructed, and its operations, which began in January, 1829, have completely realized the most sanguine expectations of its projector.

The filter-bed at Chelsea occupies about one acre; its sides are formed with brick-work, and two reservoirs attached to it consist of about one acre and a half. The water being first pumped into the latter, settles prior to its being permitted to pass into the filter-bed; and as the bottoms of the former are level with the top of the latter the water flows into it through small pipes without disturbing the sediment. The greater part of the extraneous matter being separated by the deposition of its feculence, whilst standing in the reservoirs, the water rapidly percolates through the gravel and sand of which the beds are formed. Indeed so completely efficacious is this contrivance, that the quantity of water daily filtered amounts to about 10,000 long tons, each consisting of 224 imperial gallons. [In American liquid measure the daily quantity filtered was thus 2,688,000 gal.—EDITOR.] The cost of constructing these reservoirs altogether was nearly £12,000; and the expenses annually attending them are estimated at about £1,000.

Effective for its object as the first plan of Mr. Simpson had proved, it ought to be stated that in constructing the large filtering bed, he not only introduced some improvements, but also combined with his own contrivance, the advantages which the filtering processes practised at other places had suggested to him.

Three Layers of Sand and Gravel Above "Tunnels"

The filtering bed at Chelsea, prior to its being filled with water, has the appearance of several channels parallel to each other, formed by banks, which are broad at the bottom and gradually slope on each side to a point at the top. These banks are composed of three different strata of gravel and sand, carefully laid over tunnels, constructed with bricks, but without the intervention of any mortar. In forming them a stratum of fine gravel is first laid over the brick-work; then the same quantity of finer gravel mixed with coarse sand; and lastly, a layer of fine sand. Each layer has a thickness of two feet, consequently the water passes through the whole mass of materials six feet in thickness.

The precaution is adopted of well washing the sand and gravel previously to their being employed; and experiments have satisfactorily proved that the process is most completely effective, when the uppermost stratum of the filter consists of the finest sand. Besides this mode of forming it has another advantage, inasmuch as the feculent matter being chiefly deposited upon the smooth surface of the sand, the accumulated sediment may be easily removed, by carefully scraping it off with an appropriate instrument.

It is remarkable that the matter deposited in the process of filtration scarcely ever penetrates the upper stratum further than the depth of about three inches; but as the greater portion of it rests upon the surface, the removal of the sediment to the thickness of about half an inch, has generally proved quite sufficient to renovate the efficiency of the filter. Circumstances have likewise demonstrated that the inclemency of the seasons does not affect the action of this contrivance, for during severe frosts, and when the ice has been several inches thick, the process of filtration has regularly proceeded without interruption.

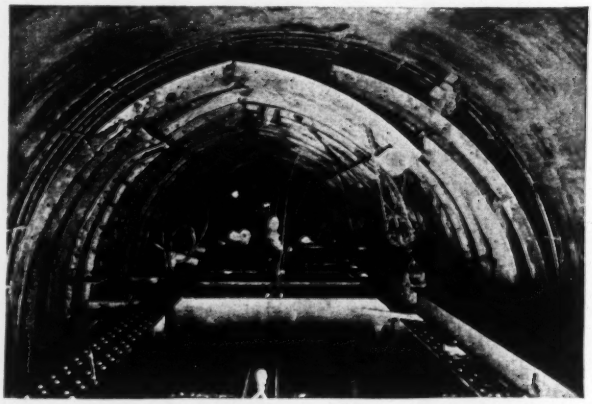
Full-Circle Section of 17-Ft. Tunnel Lined in Single Pour

Circular Steel Forms 40 Ft. Long on 83-Ft. Carriage Simplify and Speed Up Lining of Cushman Tunnel Near Tacoma, Wash.

THE CUSHMAN No. 2 tunnel is about 13,000 ft. long and has a diameter of 17 ft. inside the lining. It is located on the Olympic peninsula, about 70 miles northwest of Tacoma, and is being built to convey water from the Skokomish River through a spur of the Olympic Mountains to develop a static head of 475 ft. on the hydraulic turbines of a 75,000-kw. plant located on tidewater. The power plant is being built on the shore of Hood Canal, an arm of Puget Sound.

Excavation proceeded from the two portals and from an adit and shaft. Driving was carried on by the poling-board and crown-bar method, using a 7x8-ft. center heading which was kept 60 ft. ahead of the side timbering. From the center heading wings were carried out on either side until the 12x12-in. wall plates could be set, after which permanent timbering was put in.

Plumb posts were set to give a horizontal clearance inside the timbering of 18 ft. 4 in., and a five-segment



CIRCULAR FORM SECTION COLLAPSED AND MOVING AHEAD

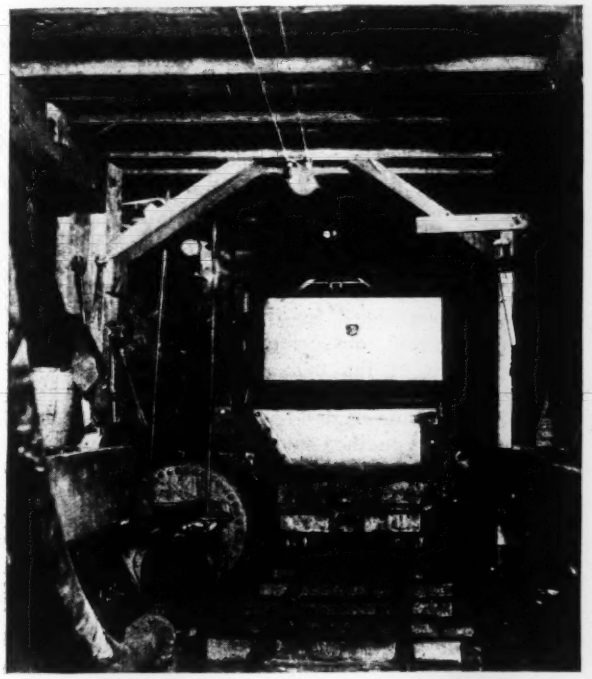
Completed concrete lining in foreground. Reinforcing for next pour is in place, form sides not yet jacked to position.

arch was used. The timber sets, 10x12 in. in size, were placed 14 in. apart.

The steel reinforcing, about 500 lb. per linear foot of tunnel, consisted of ¾-in. longitudinal bars and 1-in. circumferential bars. The spacing varies with the head, the minimum spacing being 5¼ in. at the lower end of the tunnel where the head is about 50 ft. Circumferential bars are bent to prescribed curve inside the tunnel and are lapped 40 in. on horizontal diameters.

The 3,000-ft. length of the tunnel between the surge chamber and the adit was holed through on Dec. 9, 1929; the portion between the intake portal and the shaft was holed through April 28, 1930, and the section between the adit and the shaft on June 27, 1930. It is expected that the concrete lining will be completed about Nov. 1, 1930.

A special tunnel form with pneumatic placing makes it possible to concrete a full circle of lining 17 ft. in diameter and 40 ft. long in continuous operation on the Cushman No. 2 tunnel. It was particularly desirable to place the lining of this tunnel in single-pour sections to reduce danger of leakage. Because of the porous nature of the formation (mostly gravel) traversed and the importance of conserving the water supply, copper water stops were specified in all construction joints. Under the plan of operation described, the water stops are required only in the circumferential joints which occur at 40-ft. intervals. If a separate pour had been made of the invert, requiring a water stop along each side, an additional 26,000 lin.ft. of water stop would have been required at an estimated cost of about $15,000.



PNEUMATIC DUMP CAR LOADING CONCRETE GUN
Delivery pipe, 6 in. in diameter, curves upward from gun in left foreground and runs thence for 40 ft. along form arch.

Lining Procedure and Equipment

After the timbering was in place, additional excavation was made in the invert to provide space for the track that carries the equipment. With invert excavation completed, the height of the tunnel excavation on the center line is about 20 ft. from invert to crown. In the invert, sills, crossties and, finally, longitudinal stringers were used to support the rails of the 8-ft. gage track which carries the steel form and its supporting carriage.

Carriage and Forms—The carriage consists essentially of two 5-ft. steel girders, 83 ft. long, supported on four legs or end posts consisting of 8-in., H-section steel columns. The two girders are 8 ft. apart and each one carries along its upper flange a row of flanged wheels serving as rollers on which the circular steel form is advanced along the carriage when being moved ahead to a new position. The cylindrical steel form is so constructed and hinged that it is readily collapsed for moving ahead on the girder carriage and then again expanded into position for placing the concrete. It is readily set to proper grade by means of a ratchet jack on each of the four legs of the carriage.

Adjusting the form to alignment and to grade is accomplished by aligning the center point of the invert at the advancing edge; the crown of the arch at the opposite end of the form is already fixed as to location by the arch of the preceding concrete pour. Because a transit line can be carried through the form and its carriage, and also because the track on which the carriage operates has been located by instrument, final alignment of the form is quick and accurate. The time of stripping, oiling and setting this 40-ft. form is approximately 1½ hours.

Pneumatic Concreting—All concrete is put into the form by means of a 2-cu.yd. pneumatic concrete gun with a 6-in. delivery pipe about 80 ft. long. Of this line 40 ft. on the delivery end is straight pipe terminating in a baffle box built in the form of a shoe to slide along the top of the steel arch. The concrete gun is mounted in a carriage operating on the 8-ft. gage track ahead of the form carriage. During the pouring operation, gun carriage and pipe continually move as a unit forward and backward along the 40-ft. length of the form. Thus concrete is deposited evenly at the rate of about 25 to 30 cu.yd. per hour until the space around the cylindrical form is filled. The volume of concrete averages about 3.5 cu.yd. per linear foot of tunnel, or some 140 cu.yd. per 40-ft. form.

The circular form is prevented from floating upward as the concrete level rises because of timber struts which are wedged in between the under side of the steel girders on the carriage and a longitudinal run of angle irons crossing the ribs on either side of the form. The circular form contains three inspection hatches approximately 10 ft. apart longitudinally, two being in the side walls and one at the crown of the arch. There is not enough space behind the forms for workmen to tamp the concrete, but small pneumatic hammers are used to tap the inside of the forms throughout the pouring operation. Two hammers per 40-ft. section are used.

The thickness of the concrete lining is specified as 15-in. average with 8-in. minimum inside the timbering. Additional space at the crown of the arch to facilitate clearance for movement of the delivery pipe was secured by flattening the crown section of the form 4 in. at the center. This allows a clearance of about 10 in. between the steel reinforcing and the plates of the arch form.

Moving Forms—With the circular steel form rigidly bolted together and after the concrete has been compacted tightly behind it there is no further need of the carriage support. Therefore, after the concreting crew finishes its shift the first operation of the next shift is to jack down the carriage from contact with the circular form and to move the carriage ahead 40 ft. This still

leaves the after portion of the carriage underneath the entire length of the concrete form although the latter is not at this time resting on the carriage.

In this position the forward part of the carriage, which is provided with a timber platform below the top of the steel girder, constitutes a working platform from which the steel reinforcing is placed in the arch of the section next to be poured. The form is then advanced along its carriage by the use of a small compressed air hoist and is jacked up into proper position for receiving the next pour. As a final operation this crew fits short pieces of 1-in. board into place around the open forward end of the form, thus closing up, except for the small aperture at the crown where the delivery pipe enters, the space to be filled with concrete.

Lining Sequence and Output

Concrete plant capacity and the sequence of lining operations were laid out so that the concrete crew can work 8 hours out of each 24, placing in this shift the 140 cu.yd. required for each set-up of the form. It takes about 8 hours to place steel reinforcing bars in a 40-ft. length of the tunnel so that one 8-hour shift, which immediately follows the concreting crew, is occupied with placing steel. The third 8-hour shift, which employs a smaller number of men, performs a general clean-up service.

Lining operations were started March 1 with one set of forms. Later a second set of form units was put in operation and each placed 40 ft. of concrete per day for several weeks before the third unit was delivered. When all three lining units are operating, concrete will be delivered from two mixing plants, one at the intake portal and one over a small shaft sunk for this express purpose about 600 ft. upstream from the adit.

Trains are moved between concrete plant and pneumatic gun by locomotives of two types, namely, storage battery and gasoline engine. Each concrete car is hinged along one side so it can be tilted and its contents dumped into the gun by means of a compressed air cylinder slung from the frame supporting the pneumatic gun. The gun and the dump cars (except in the matter of the air cylinder) are similar to the equipment used on the Duboce tunnel in San Francisco (*Engineering News-Record*, Feb. 2, 1928, p. 201). By this means the 2-cu.yd. batch from each car is dumped into the gun with very little aid from the concrete crew.

Ordinarily it requires about 60 sec. to deliver the 2-cu.yd. charge from the gun through the delivery pipe and into the forms, the baffle at the end of the delivery pipe constituting a check which slows up discharge and prevents the scattering of the mix with the attendant danger of segregation. The baffle box absorbs the shock of delivery and diverts the concrete in relatively gentle flow from the delivery pipe to the chutes or wings, which flank the open ends of the baffle box and slide along the steel arch form as the delivery pipe moves to and fro.

Direction of Work

The work is being done for the city of Tacoma under the direction of J. L. Stannard, chief engineer, department of utilities, and J. V. Gongwer, assistant chief engineer. Floyd E. Rogers is resident engineer for the city on the tunnel. Contract for driving and lining the tunnel is being carried out by the Youdall Construction Co. Roy C. Hackley, one of the partners in that firm, developed and patented the design of the cylindrical steel forms, the concrete guns, and the complete placing equipment.

Floodway Friction Factors for Fairly Well-Defined Channels

EXPERIMENTAL determinations of friction factor in floodways that are more or less forested ar usually calculated into Kutter's *n*. Few data are avail able. The outstanding work was done by C. E. Ramse hydraulic engineer, U. S. Bureau of Public Road reported in *Engineering News-Record* of April 5, 192 p. 541, in the Little River Drainage District in soutl ern Missouri. During the Mississippi rise of March an April of 1929 the U. S. Engineers of the New Orlean River District made observations of flows across a nar row neck called Cowpen Neck, just above Natchez F. C. Carey, senior engineer, reports on the tests in recent issue of the *Review*, a bulletin of the Second New Orleans District. A brief summary follows.

The observations were made over land covered witl a good growth of cottonwood, willow and sycamor trees, varying from 8 in. to 2 ft. in diameter, with but little underbrush except low weed growth. A number of fairly well-defined channels where the timber is large and undergrowth is largely absent traverse this area. It was along these channels that the observations were made.

The method of making observations consisted first of a general reconnaissance of the area to determine the places best suited for the work. Floats were then used to determine the course of travel of the water along various lines. These lines were established by blazing trees at intervals along the courses followed by the floats. Slopes were established by driving nails in the trees along the lines and measuring down to the water surface from each of the nails. Depths were measured by means of a sounding rod, at intervals sufficiently close to establish the mean depths between meter stations. Double meters were then run at 0.2 and 0.8 depth for five minutes at each meter station—generally 300 to 500 ft. apart.

After the water had receded levels were run along each line to determine slopes and the lines were instrumentally located for plotting on a chart, while photographs showing timber, drift, etc., were taken at each meter station. The fire which recently gutted the Engineer Building destroyed three-fourths of the original field notes on this work, but what was left has been worked up and values of Kutter's *n* computed. The observed velocities varied between 0.865 ft. per second and 3.4 ft. per second. The mean depths between observation stations varied between 2.3 ft. and 12.5 ft. Kutter's *n* varied between 0.036 and 0.186, the average of all observations being 0.086.

The observations at Cowpen Neck were satisfactory in that the resulting computations indicated the values of Kutter's coefficient *n* for the paths traversed by the water, but it is believed that more comprehensive results can be obtained by somewhat changing the method used on this work. In allowing floats to determine each course for the observations automatically there was secured a result which represented not average flow conditions in the area but the flow conditions in the most efficient channels. The values determined are only the values of the coefficient for these rudimentary channels instead of values applicable to entire areas. In making observations of this kind in the future, courses will be laid out away from channels of higher hydraulic efficiency.

This work was carried out under the general direction of W. H. Holcombe, major, Corps of Engineers.

Reconstructing Failed Bascule Bridge Over Hackensack River

New East Leaf Installed With Redesigned Counterweight Links and Guide Tower Columns—Derrick Boats and Careful Planning Assist in Maintaining Traffic During Rebuilding Work

By C. H. Gronquist
Assistant Engineer, Robinson & Steinman, Consulting Engineers, New York City

THE RECENTLY completed reconstruction of the Lincoln Highway double-leaf bascule bridge over the Hackensack River between Jersey City and Newark, N. J., the east leaf of which failed in December, 1928 (*Engineering News-Record*, Dec. 20, 1928, p. 931), involved the rebuilding of the east leaf, with the exception of the A-frames, which were merely strengthened, and also involved the reinforcement of the tower and links of the old west leaf. Both river and highway traffic were maintained during the entire period of reconstruction. Each 40-ton "rocker-arm" truss section near the main trunnion was assembled and riveted on a barge and erected as a single piece. Reconstruction of the roadway under traffic was accomplished by tearing up and rebuilding completely two of the four lanes at a time. The concrete counterweight was poured in its up-position, the weight, after the first pour, being carried directly into the main trusses.

Fig. 2 shows the new east leaf and counterweight. From trunnion to trunnion the double-leaf bascule had a span of 196 ft. It was of the vertical overhead counterweight type. Half-through trusses, 15 ft. deep and 46½ ft. c. to c., supported two 7½-ft. outside sidewalks in addition to a four-lane roadway with two electric car tracks. The concrete counterweight which balanced the dead-load of each leaf weighed nearly 800 tons.

Following the failure of the east leaf, a specially appointed board of engineers (*Engineering News-Record*, Jan. 10, 1929, p. 74 and June 6, 1929, p. 916) attributed the collapse to the failure of the north counterweight guide-tower column and recommended that the counterweight posts and guide-tower columns on the west leaf be strengthened before reopening the bridge to traffic. After the west leaf had been temporarily strengthened and a temporary timber trestle had been constructed over the east channel, the bridge was again opened to highway traffic, which was not interrupted during the period of reconstruction.

FIG. 1—FALSEWORK FOR SUPPORTING FIRST POUR OF COUNTERWEIGHT
Roadway is on temporary trestle over east channel. Opening between roadway and sidewalk left for entering trusses of new leaf.

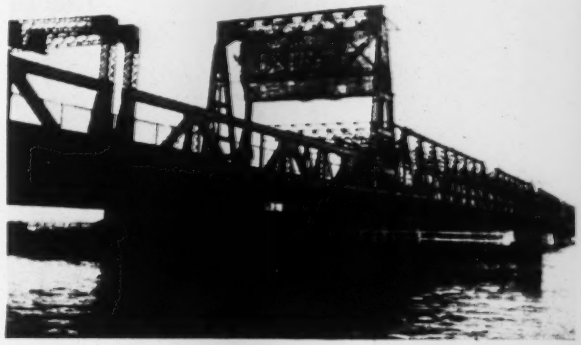


FIG. 2—NEW EAST LEAF OF HACKENSACK RIVER BRIDGE

Aside from the revision of some details, the only material changes made in the structure were the redesign of the counterweight links and guide-tower columns. The construction of the link was changed from that of a latticed member to one with a solid web. Front and rear braces were added to the guide-tower columns as shown in Fig. 3.

The A-frames or trunnion supports of the east leaf were very little damaged and the piers were not affected, so that it was unnecessary to rebuild these A-frames or to replace the fixed span and the machinery room and equipment. The bent tops of the trunnion girders and the live-load supports, which had been crushed by the weight of the falling leaf, were, however, completely rebuilt before proceeding with the erection of the main trusses.

Erection of Main Trusses—Erection of the main trusses and floorbeams was facilitated by the construction of the temporary timber trestle over the east channel. As may be seen in Fig. 1, openings had been left between the roadway and the sidewalks for the erection of the trusses, and additional openings were left beneath the roadway to permit the placing of the floorbeams without disturbing the timber framing.

The scheme adopted for the erection of the "rocker arm" section of the new truss at the main trunnion was to assemble and rivet the members on a barge and then to place the entire 40-ton section in position by means of a derrick boat. This method obviated the necessity of erecting the sections piecemeal ahead of final position, which would have been necessary to permit riveting between the closely spaced A-frames. All erection was done by derrick boat equipment.

Rebuilding the Roadway—In placing a new roadway, a 12x12-in. timber with a guard rail was placed down the middle of the four lane roadway, confining traffic to two lanes, while the other two lanes were being floored. It required 11½ working days to reconstruct the roadway, which included the tearing out of the temporary roadway and supporting timber, the erection and riveting of the floor steel, the placing of timber ties across the stringers, the relaying of the street car rails, the laying of plank on top of the ties lengthwise of the bridge, waterproofing, and the paving of the roadway with wood block.

Counterweight Construction—The counterweight is a concrete block approximately 11ft.6in.x48ft.10in.x20ft., supported by and incasing the heavy steel counterweight frame. It was constructed 25 ft. above the roadway. The first 3½-ft. lift was supported on a timber bent, shown in Fig. 1, but the weight of subsequent pours of concrete was transferred directly into the counterweight frame and main trusses. For this reason, the pouring was delayed until the major part of the steelwork was in place and riveted. The first pour was permitted to set for one week before proceeding. After a depth of 7 ft. had been poured, outside forms were constructed to the full 20-ft. height, as shown in Fig. 5.

Tests by the specific gravity method, at uniform intervals during the pouring, showed that the 1:2:4 concrete mix developed an average weight of 151.3 lb. per cubic foot. Steel punchings were also placed in the central portion of the counterweight below the balance-block pockets. The procedure in pouring the punchings-concrete was as follows: The concrete was delivered ready mixed at the job and chuted from the roadway to a large hopper under the north sidewalk of the approach truss alongside the hopper in which the punchings were held. The proper amounts of concrete and punchings were then run into the bucket on the boom of the derrick boat and raised to a small hopper on the north end of the link frame above the counterweight. From here contents were chuted to several points in the counterweight.

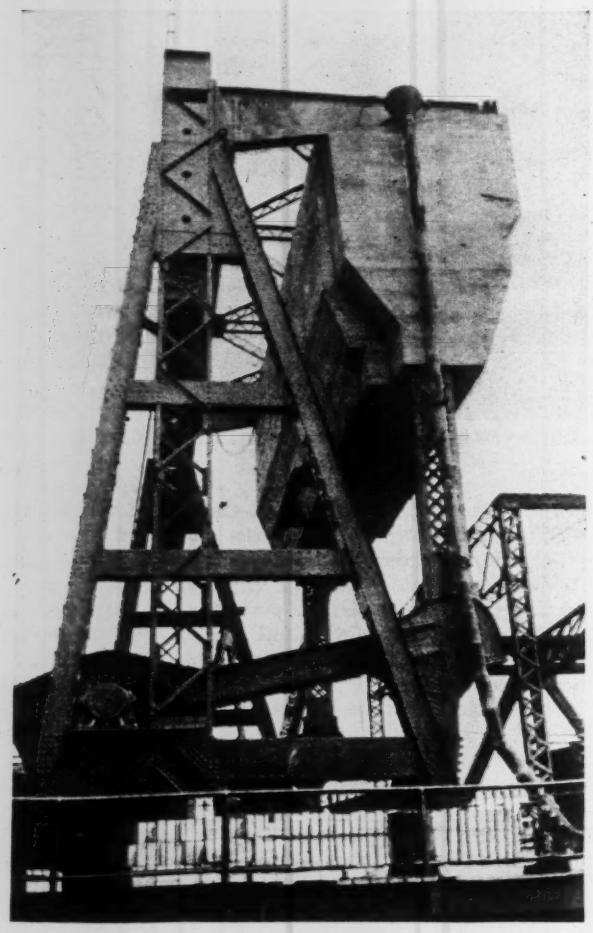


FIG. 3—REDESIGNED COUNTERWEIGHT TOWER, HACKENSACK BRIDGE
New members include the A-frame and solid-web link between top of the tower and counterweight.

FIG. 4—ERECTING ROCKER-ARM SECTION OF TRUSS

Reinforcement of West Leaf—Upon the recommendation of the board of engineers, the west leaf had been partly reinforced by the placing of additional latticing on the counterweight posts and the erection of front braces on the counterweight tower columns before reopening the bridge to traffic. In conformance with the revised construction on the east leaf, the west leaf was further reinforced after the completion of the east leaf by the addition of rear braces on the counterweight towers and the reinforcement of the links connecting the counterweight to the tower. This latter reinforcement consisted of the addition of 6x4x⅜-in. angles to the bottom chord and of new pin plates and tension hairpins.

The Frederick Snare Corp., of New York, F. J. Litter chief engineer, was responsible for the erection design and methods used. The reconstruction was under the direction of Prof. George E. Beggs of Princeton University, and D. B. Steinman, consulting engineer, New York City, who acted as consultants to the state highway commission. J. L. Bauer is state highway engineer, and Morris Goodkind, state bridge engineer. The writer was the representative of the consulting engineers.

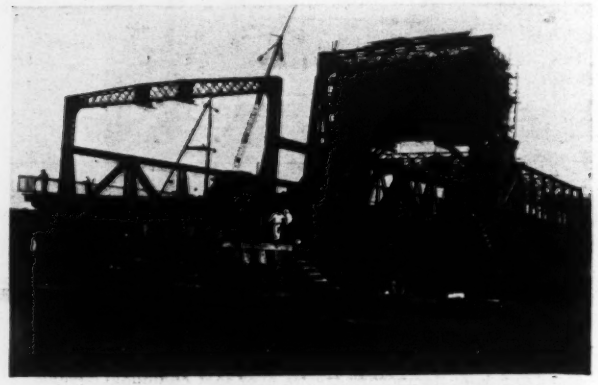


FIG. 5—NEW EAST LEAF NEARING COMPLETION
West leaf is raised. Counterweight concrete is being placed.

Shop Crane Built of Strong Aluminum Alloy

Crane of 10-Ton Capacity With 72-Ft. Span Installed at Massena, N. Y., To Compare With Identical Crane of Steel

By F. V. Hartman and E. C. Hartmann
Physical Testing Division, Aluminum Research Laboratories, Aluminum Company of America

A NEW example of the application of the strong alloys of aluminum in the field of structural engineering is found in the 10-ton traveling crane recently installed in the works of the United States Aluminum Co. at Massena, N. Y. With the exception of the framework for lighter-than-air craft this is the largest structural application of aluminum to date. The Messena crane is a three-motor, single-hook machine with a lift of 22 ft. The bridge is fabricated from two double-web girders spaced 7 ft. on centers and spanning 72 ft. 2 in. The web plates are 46x$\frac{5}{16}$ in. Flange angles are 3½x3½x½ in. and cover plates, top and bottom, are 24x$\frac{3}{8}$ in. In addition to the girders, aluminum is also used in the walkway, handrails and operator's cage. The bridge girders frame into cast-steel carriages at their ends, and a one-piece cast-steel trolley carrying the hoisting mechanism is mounted on the girder rails.

The design of the crane was based largely upon the usual practice followed in building steel cranes, although certain departures were necessary in the case of the bridge girders since aluminum and steel differ in some of their mechanical properties. While the strength of structural steel and of the heat-treated strong aluminum alloys is approximately the same, the modulus of elasticity of aluminum is only about one-third that of steel. Because of this difference in the modulus of elasticity, an aluminum girder having a cross-section identical to that of a steel girder would deflect about three times as much under load and have less lateral stiffness. It was, therefore, necessary to construct the girders of the aluminum alloy crane with sections somewhat deeper, wider, and greater in area. In addition, the girders were given approximately twice as much camber as would ordinarily be used in a similar steel girder.

Fabrication—The aluminum alloy crane was built by the Alliance Machine Co., Alliance, Ohio. Although this company had had no previous experience with aluminum alloys, it encountered no fabrication difficulties. The web and cover plates were flattened and sheared on the same equipment ordinarily used in the construction of steel girders. The rivet holes were sub-punched and then reamed to size in the usual manner. Hot steel rivets, ¾ in. in diameter, were used throughout, driven with air-operated squeeze riveters, except for some of the more inaccessible ones, which required pneumatic hammers. No difficulty was experienced in riveting the girders, although a few special precautions were taken. For instance, excessive rivet temperatures were avoided, to decrease the possibility of heating the aluminum plates sufficiently to draw their temper. Also, the rivets were driven at random during the assembly of the box girders in order not to concentrate the heating effect of the rivets and in order to help in keeping the girder straight.

It was necessary to use more splices in the aluminum alloy girders than are usually found in steel girders, since long plates and angles were not available at the time the crane was fabricated. Aluminum alloys were not used for the end trucks and trolleys because the urgent need for this crane did not allow sufficient time to redesign and cast these parts in aluminum.

In the same plant with this aluminum crane a standard steel crane of the same capacity and span length was erected for purposes of comparison. The two cranes were similar in design with the exception of the girders. The moment of inertia of the aluminum section about the horizontal axis based on gross area is approximately 21 per cent greater than that of the steel section. The accompanying table gives the weights of the two cranes. A total of twelve tons was saved in the aluminum alloy crane over the steel crane, mostly in the girders. It is

COMPARATIVE WEIGHTS OF ALUMINUM AND STEEL 10-TON CRANES

	Aluminum Crane, Lb.	Steel Crane, Lb.
Trolley, including motors, brakes, etc.	16,000*	16,000
Main girder, including shafting, pedestals, walkway, rail, etc.	14,100	24,000
Bridge motor and supports	3,900	4,800
Auxiliary girders, including weight of conductor-angles, brackets, etc.	11,900	20,200
End carriages	15,000*	15,000
Operator's cage, including controls, etc.	3,200	5,000
Miscellaneous items	2,900	6,000
Total	67,000	91,000

*Not fabricated from aluminum.

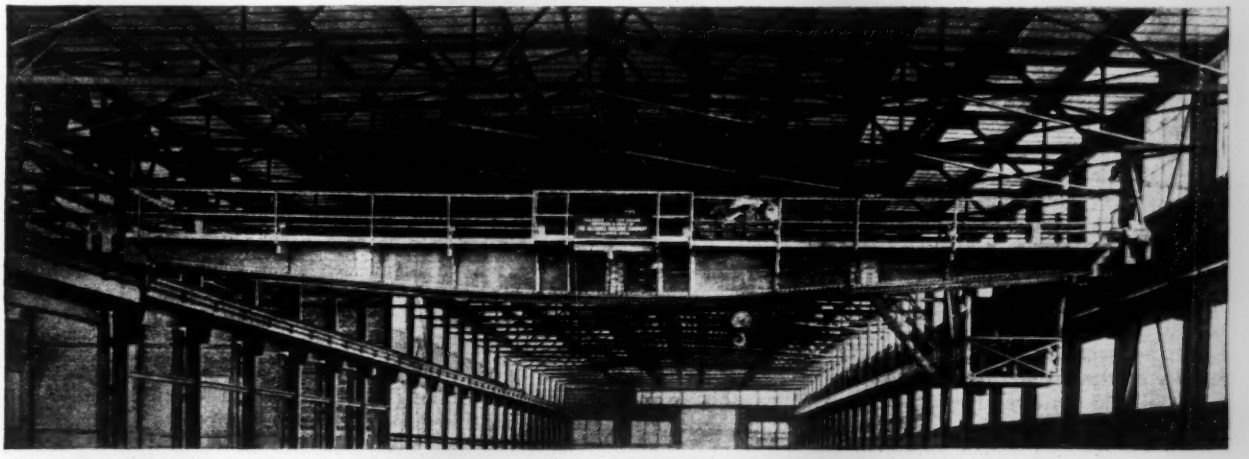
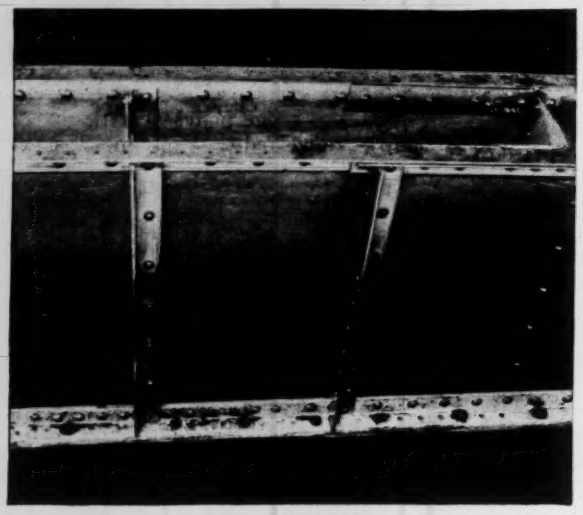


FIG. 1—ALUMINUM CRANE OF 10-TON RATED CAPACITY, 72-FT. SPAN



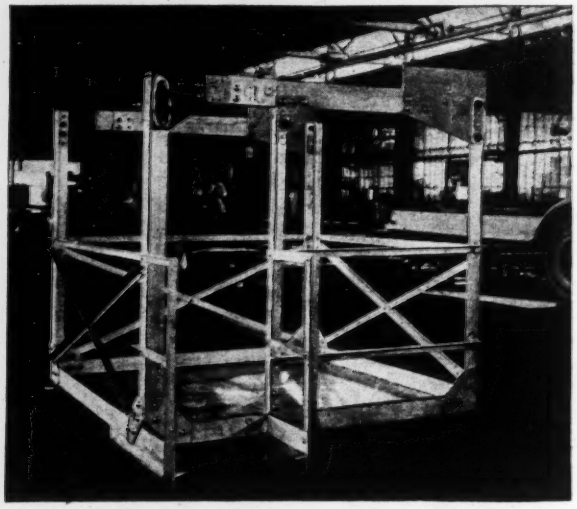


FIG. 2—FABRICATING A 10-TON SHOP CRANE OF ALUMINUM ALLOY SHAPES
Above: riveting top cover plate of girder. Below, left: crane girder without cover plate showing double-web construction. Below, right: operator's cage of angles and plates.

probable that if a more extensive use had been made of aluminum, notably in the castings for the trolley and end carriages, this saving could have been increased to about 20 tons. The advantages of such a saving in weight are important. Where 12 to 20 tons can be saved in the dead weight of the crane, a corresponding reduction can be made in the supporting members throughout the whole length of the runway, which is 700 ft. long at Massena. The light weight of the crane also permits a saving in power, owing to the smaller inertia to be overcome in starting and stopping the crane.

Tests have been made on the two cranes to compare their performance and action under load. The aluminum alloy crane was found to deflect 1.8 times as far as the steel crane under the same load at the center of the span. This ratio of deflection was less than would be predicted, probably because of the stiffening effect of the extra splice material on the lighter crane. The maximum deflection measured on the aluminum alloy crane was 1.09 inches, under a load of 34,500 lb., which represents an overload of 72.5 per cent, based on the rated capacity of the crane. No measurable permanent set was found in the girders upon the removal of this load. Strain gage readings taken at the center of the span indicated no stresses which exceeded those computed by ordinary design formulas.

In the matter of performance, the aluminum alloy crane has proven to be satisfactory in every way. Several experienced operators have expressed the opinion that it is very easy to handle and quick to spot. While the crane has not been in use long enough to obtain a definite comparison of the power requirements, indications point to a much lower power consumption than is necessary to operate the heavier steel crane.

Elevation of Eastern Peaks Determined

Accurate level lines have now been run by the U. S. Geological Survey to six of the higher mountains in the eastern part of the United States. Mount Mitchell, in North Carolina, which is probably the highest point in the United States east of the Mississippi River, is 6,684 ft. above mean sea level. Three peaks in the proposed Great Smoky Mountains National Park are Clingmans Dome, on the North Carolina-Tennessee state line, which has an elevation of 6,642 ft.; Mount Guyot, also on the North Carolina-Tennessee line, 6,621 ft.; and Le Conte (Myrtle Top), in Tennessee, 6,593 ft. Mount Washington, in New Hampshire, is 6,288 ft. above mean sea level, and Mount Katahdin, in Maine, 5,267 ft.

Station Platform Roofs Redesigned for Welded Connections

FOR THE widening of the union station at St. Louis, Mo., platform shelter roofs of the butterfly type have been adopted, with four double shelters 1,100 ft. and 420 ft. long and one single shelter 680 ft. long. Circular cast-iron columns, containing the downspouts, support the structural-steel brackets and longitudinal struts of the roof framing, which is covered with asbestos-sheathed corrugated metal.

As designed originally, the roof framing was to be of riveted construction, the brackets being built up of steel plates and bent angles, connected by 12-in. longitudinal struts between the columns, channel purlins and double-channel eaves struts. The contractor for this framing (exclusive of the columns) believed that a saving could be made by redesigning for arc-welding instead of riveting. Such a design was made and a substantial reduction in price was found possible. This first design for welding contemplated the use of vertical web plates and horizontal flange plates in both brackets and struts, with two lines of arc-welding connecting the plates together. Further study resulted in a change of design with increased economy. As actually built, the longitudinal struts, about 30 ft. long with a 3-ft. curved bracket at each end, are made of 12-in. I-beams. The lower flanges of the beams at each end were stripped off for about 2½ ft.; triangular web plates were joined to the beam web, curved plates were added to complete the bottom flanges, and end plates were attached for column connections. All joints are arc-welded with continuous fillet weld on each side.

The butterfly brackets have a spread of about 10 ft. from center of column. At the outer end the depth is about 8 in., increasing to 15 in. at 3 ft. from the column, where a curve begins, the bracket meeting the column with a depth of 3½ ft. Its main member is a 12-in. I-beam, split through the web on a diagonal line (see Fig. 1). After splitting, one of the pieces was turned end for end, and the two pieces were then joined, making a member of tapering shape. Triangular web plates were added; also bottom-flange plates near the columns. Small vertical bars were welded to the beam webs to take the eaves strut and purlin connections. Except for the seam in the beam itself, the welds were continuous fillets on each side.

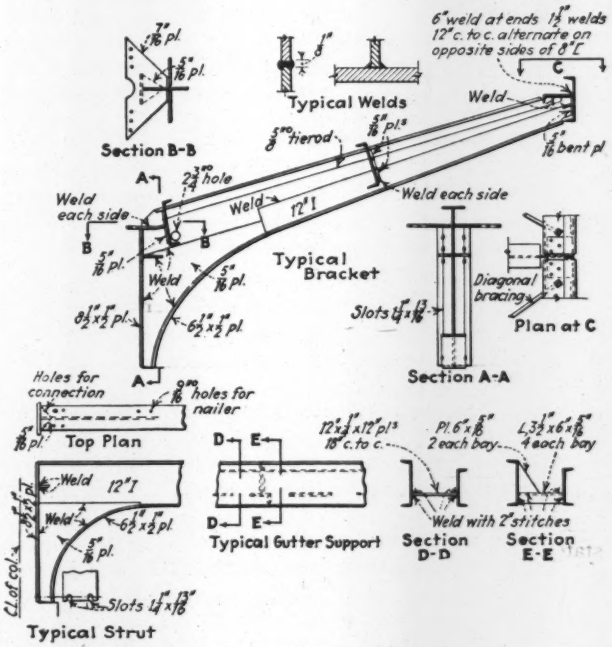


FIG. 1—DETAILS OF WELDED PLATFORM SHELTERS

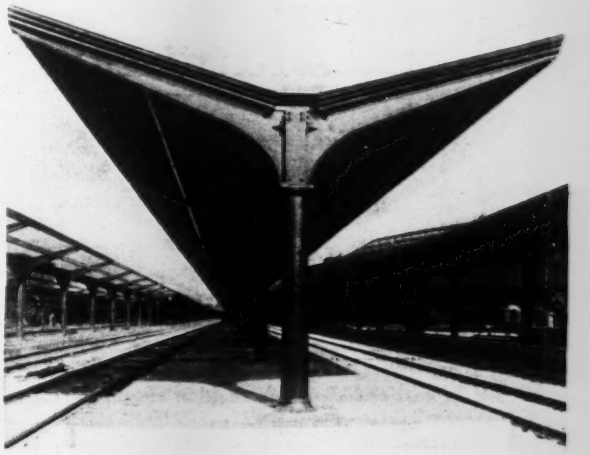


FIG. 2—PLATFORM SHELTERS WITH WELDED FRAMING

In splitting the 12-in. I-beams for the brackets, the burning flame was supported on a motor-driven carriage and the flame was carried at an angle to the plane of the web, making a cut diagonally through the thickness of the web. Turning one of the beam pieces end for end reversed the sides of the webs and thus formed a V at the joint line, so that it was necessary to weld in this V from one side only. As there was large duplication, steel jigs were provided to maintain the outside dimensions of pieces, and the individual pieces were clamped into position in these jigs for arc-welding.

About 600 tons of steel was used for these platform shelters, the work being fabricated at the St. Louis plant of the Mississippi Valley Structural Steel Co., which prepared the welded design. The engineers and general contractors for the enlargement of the station, as described in *Engineering News-Record* of Nov. 22, 1928, p. 766, are Dwight P. Robinson & Co., New York. Both design and construction were under the supervision of H. J. Pfeifer as chief engineer of the Terminal Railroad Association of St. Louis.

Water-Works Construction in the Philippines

Numerous projects for the improvement of water-works in the Philippine Islands estimated to cost approximately $3,000,000 have already been examined and tentatively approved, while an additional $3,000,000 is being expended on 75 other water-works which are now in the process of construction, according to a report from Clarence P. Harper, assistant trade commissioner at Manila. It is reported that in the matter of sewage disposal comparatively little has been accomplished in the Philippines by the insular government. Manila has a satisfactory system, although the sewage is discharged into Manila Bay without treatment. This system does not serve the entire city, however, and will have to be very much augmented and improved to keep pace with the city's growth.

World's Road Builders Meet at Washington

Delegations From 63 Countries Join in Sixth International Road Congress to Discuss Construction Methods, Finance, Traffic Control, Administration, and Road-Rail Co-ordination—Language Difficulties Successfully Overcome

A MEETING distinguished both by the magnitude and world-wide character of its representation and by the seriousness of purpose of the delegates, the Sixth International Road Congress at Washington last week brought road men from every important country of the earth. Like earlier congresses, held at four-year intervals during more than twenty years, the Washington meeting had official character, being assembled on governmental invitation and attended by official delegations named by the governments of other countries. While this fact limited its discussions and gave a slightly political cast to some of the proceedings, it was outweighed by the evident concern of all the members with the urgent problems of road extension and improvement.

Exhibitions and Inspection Tours

Before the technical proceedings are taken up it is important to note that the strongest organizations in the field of roads and motor vehicles co-operated in making arrangements for the congress, chief among them the U. S. Bureau of Public Roads, the American Road Builders Association, the Highway Industries Association, the American Automobile Association, the Association of State Highway Officials and the Highway Education Board. What these organizations contributed formed perhaps the most instructive part of the congress activities.

An effective, up-to-date exhibition of road construction machinery and materials was held in the Washington Auditorium and in a field exhibit space; it was made more informative by various working demonstrations. The road research operations of the Arlington experiment station of the Bureau of Public Roads were displayed by being moved out from the several laboratories into adjoining outdoor exhibit areas, where they were carried on in full working form by test operators and explained by lecturers. An example of express-road construction was shown to the congress delegates by means of a bus trip along and over the Mount Vernon Memorial Highway, extending 17 miles from Washington along the south bank of the Potomac to the home of George Washington. Finally, a set of three post-congress bus tours of two weeks' duration was provided for the delegates by the Highway Education Board and the American Automobile Association. The tours extended respectively into New England, the South Atlantic states and the Central states, all with termination at Detroit. By these several means a remarkably complete picture of current American thought and procedure in the road field was placed before the visitors.

Among the preparatory contributions to the success of the congress, the interpretation system was notably important. It comprised a corps of multilingual interpreters, a set of four telephone systems from the interpreters' tables to the seats of the delegates, with a telephone headset at each seat, a marking off of the session room into four language zones, each commanded by one of the four telephone systems, and automatic microphone-phonograph recording of the discussions. These arrangements were provided in each of the two session rooms—the congress proceedings being unfortunately divided between two separate sections, sitting simultaneously, one on subjects relating to construction, the other on finance and operation of roads.

Interpretation System Highly Effective

Congress proceedings were carried on in four languages: English, German, Spanish and French. Automatic recording was done in the original language, by phonographs connected to microphones at the desk of the presiding officer and at a stand to be occupied by speaker or discusser. Before the platform was the interpreters' table, equipped with four telephone transmitters, each connected to the head-phones of one of the sections of the room, these sections being marked respectively for the four official languages. Original reports were in all cases presented in English, since the general reporters on all six "questions" constituting the congress program were chosen from the United States, in accordance with the established custom of the congress organization. Discussions, however, might be in any one of the official languages. Whatever the language of a speaker, his remarks while being delivered were transmitted in the other three languages to the respective divisions of the room by the interpreters through the telephone systems, each interpreter making a phrase-by-phrase or sentence-by-sentence rendering of the speaker's remarks.

This system proved in all respects successful in its operation, the renderings being both true and prompt. Its effect was to give everyone present as complete and instantaneous a knowledge of the proceedings as though all discussion had been in his own language—perhaps a better knowledge, since the acoustics of the meeting rooms were poor. The tempo of the proceedings therefore was rapid, and delays or misunderstandings were absent.

Conclusions Only Considered

Of the business proceedings of the congress an item of general importance was the decision to establish national organizing committees in the several countries to enlarge and strengthen the congress organization.

In the technical sessions discussion was in all cases restricted to remarks for or against the conclusions. As the latter were intended for universal application, the delegation of each country strove to eliminate from them any statement unfavorable to its practice. In consequence the conclusions often were diffuse or even platitudinous.

The original reports from the separate countries gave much information on practices, experiences, and successes or difficulties. This information, which formed no part of the congress work, will be summarized very briefly in later issues of *Engineering News-Record*. For the present we have only to indicate the nature of the

discussions on the conclusions and note the major conclusions themselves.

Financing Highways

Col. A. B. Barber, of the Chamber of Commerce of the United States, was general reporter on "Ways and Means of Financing Highways." He presented a series of conclusions whose chief items may be summarized thus:

> Extensive road construction and improvement is made necessary by the motor vehicle, and its economies justify the work. The work is urgent in all countries. Advance programming and budgeting is important. Every program should include provision for maintenance. Roads should be classified according to their traffic as for general or local use, with interest and responsibility for the road placed accordingly. All-year secondary roads may need first attention in undeveloped countries. On roads of national concern, subsidies or loans are an effective means through which the higher authorities may advise or supervise the lower authorities.
>
> Road costs should be distributed in relation to benefits and taxable capacity. General taxes are a desirable source of funds to represent general benefits, especially as to local roads and city streets. Assessments on abutting property should be proportional to actual benefits. Road-use taxes, including license fees and fuel taxes, are an important and increasing source of highway finance; they should not be allowed to become an undue burden on the user; they should be applied exclusively for highway purposes, and only for highways of general use, including the sections within cities. To expedite road construction, bond issues or other borrowings are desirable in most countries, but their life should not exceed the life of the improvement.

Some interesting discussion centered on classification and on gas-tax diversion. Attempts to establish generally applicable distinctions between general- and local-use roads proved ineffective, but the former were extended, by unanimous vote, to include city streets.

Gasoline Taxes—Gas-tax diversion was the subject of active discussion. First, the original statement that "user taxes should be imposed only by one of the higher jurisdictions" was amended to read "user taxes should be imposed only by *rules fixed by* one of the higher jurisdictions." Then M. Lipmann (France) desired to amend the statement that "user taxes should be applied exclusively for highway purposes" to read, "In all cases the attention of public authorities should be drawn to the interest of allocating the produce of these taxes in the largest measure to road work." Colonel Barber and E. J. Mehren (United States) urged retention of the original wording as a matter of basic principle, even though it cannot be carried out fully in all countries. Even France, as Colonel Barber brought out, is progressing in the direction indicated, as it now applies 60 per cent of road revenue to highway purposes, against 43 per cent a year ago. Sir Seymour Williams (England) supported the original phrasing and objected strongly to any local authority diverting any part of the road revenue to its own purposes. Dr. W. Feilchenfeld (Germany) also supported the non-diversion principle; he cited figures showing the gas tax as a fraction of the selling price of gasoline (Italy 50 per cent, France 45, England 23, Germany 22, Denmark and Sweden 20 to 21 per cent) and stated that the countries with the highest tax divert the revenue, while only Denmark and Sweden restrict the tax to road use. The outcome of the discussion was that the original form of the statement was adopted.

Highway-Railway Co-ordination

Reporting on the rather formidable question 5, "Highway transport; correlation and co-ordination with other methods of transport; adaptation to collective (organizations) and individual uses," Prof. H. R. Trumbower, of the University of Wisconsin, presented conclusions which led to much discussion and amendment. On motion of France a clause was adopted proposing the organization of a joint committee with the International Railway Congress and other organizations interested in special means of transport (waterways, air), to consider co-ordination of these several means.

On motion of Prof. F. Vezzani (Italy) the statement was included that co-ordination should be such "that every transport should be done, so far as possible, through the most economical way and that most fitted to the particular needs," and that governmental regulation should not disturb the natural economic conditions of each transportation system. With these and minor changes the conclusions were adopted. In brief summary the conclusions state:

> Highway transportation has become firmly stablished in the general scheme of transportation. Co-ordination between rail and highway transportation is one of the great requirements of the age; the public should enjoy the maximum benefits of all its transportation agencies. Highway and rail are partly complementary and partly distinct services. Common carriers form only a small part of highway traffic. Private automobiles compete most seriously with railways, and where this occurs the authorities should permit the railways to adjust schedules so as to reduce passenger train-miles as much as possible. Bus service should be controlled by an authority of wide juridiction, in the interests of efficiency and economy. Feeder service of motor vehicles increases railway traffic in some places. Either voluntary or compulsory co-ordination of rail and road service is possible. Truck operation is generally short-haul, an unprofitable field for railways. Common-carrier truck operations have not generally been profitable. Highway transportation enterprises should be self-sustaining. Co-ordination and harmony between the various systems of transportation, by road, by rail, by waterways and by air, should be considered by the various international congresses dealing with it, and reports should be prepared by joint committees.

Highway Traffic Control

Question 6, entitled "Traffic regulation in large cities and their suburbs; traffic signals; design and layout of roads and adaptation to traffic requirements in built-up areas; parking and garaging of vehicles," dealt largely with city traffic control and only in minor degree with operation or signaling of roads. Dr. Miller McClintock was general reporter. His conclusions were amended slightly in some details of wording, due to suggestions from a number of foreign delegates, but without essential change or addition. The conclusions may conveniently be summarized under three different heads:

> *General*—Shape and color of signals and signs should be relied on to give traffic indications. To further the application of the principles recommended by a diplomatic conference held in 1926, an international committee should be named to consider methods of application. The same committee should formulate uniform standards for traffic-control signals and devices. Pending this action, red signals should be used only for the purpose of stopping traffic, but red indications may be used elsewhere to denote caution, as in marking obstructions in the roadway.
>
> *Highway*—Suggested control measures in heavy-traffic sections include parking restrictions, exclusion of certain types of vehicle, lane marking, one-way movement, rotary movement at intersections where there are center islands of sufficient size and visibility, control of turning movements at intersections and of U turns, and pedestrian regulation. Highway officials should have power to protect highway safety and the recreational value of the road.
>
> *City*—Suggested methods of street reconstruction to facilitate traffic are: removal of rail carriers from street surface; marking pedestrian crossings, or providing subways or bridges as crossings; restriction of parking; provision of off-street storage space; requirement of offstreet loading and unloading of vehicles, with compulsory provision in new buildings for such loading space as well as garage space; grade separation; construction of elevated or underground streets.

Some threescore conclusions and sub-conclusions were adopted in the sessions devoted to questions 1 to 3 on methods of road construction and maintenance. Most of them expressed accepted opinions and practices and were sufficiently qualified and colorless to meet all opinions and have no constructive value. A few indicating characteristics of practice not common in America or denying the conclusions of American practice are summarized.

Concrete Roads

To meet the requirements of steel-tired practice, which prevails in many European countries, a two-course construction was recommended as follows:

> Where a large volume of steel-tired traffic is encountered, if cement concrete is adopted as a pavement material, a two-course pavement with the upper layer composed of very hard aggregates should be used instead of a single-course pavement.

Reports from European delegates were positive that ordinary concrete would not withstand the wear of their steel-tired vehicles.

Two of the conclusions of the American reporter were: (*a*) that concrete pavement compared with concrete base with a surface course of other material gives equal traffic capacity and structural strength at less cost; and (*b*) that edge thickening is necessary. These conclusions were formally objected to in discussions by J. E. Blackwell and S. C. Cook of the British delegation and Mr. Jeannin of the French delegation. In the voting the first conclusion as to comparative cost was eliminated, and the second was modified as follows: "Edge thickening is advantageous as a means of producing an economic and balanced structural design for concrete-pavement slabs."

Cement Macadam

Information was brought out in several of the European reports that broken-stone surfacing bound with cement by a penetration process has proved its usefulness. In practice the cement and sand is spread dry on the stone and soaked in by sprinkling, or is applied as a liquid grout, or the stone is laid in two courses with a mortar course between. In all cases the stone, after the mortar binder is applied, is rolled to insure compaction and the squeezing of the mortar throughout the stone. A conclusion was voted that:

> Cement-bound macadam has been successful on roads carrying light traffic not inimical to the macadam type of construction. This method seems especially advantageous in locations where the conditions of drainage or exposure are unfavorable to the use of ordinary water-bound macadam. A protective wearing surface seems equally indispensable on cement-bound and water-bound macadam.

The final sentence of the conclusion is to be noted. All European experience indicates that cement-bound macadam requires some kind of tar or asphaltic oil treatment to prevent ravelling under traffic.

Brick and Other Block Paving

Diametrical differences in brick pavement experience precluded conclusions that would reconcile practices. It was recommended therefore that specifications and tests for paving should be prepared and submitted to the next congress with a view to standardization. Rubber paving received approval as a silent paving, suitable for certain positions in large towns. Research is required in material, type of block and method of laying, joint materials and reduction of cost. No action was taken on other block paving.

Calling particular attention to the extended use of superficial coatings effected with emulsions, the reporter recommended research into the characteristics of bituminous materials and their combinations with other materials, their relation to subsoil, climate and traffic density, their economic position among road types. Slipperiness was mentioned as requiring special attention. It was indicated that valuable results have been obtained by compositions containing the maximum permissible proportion of large aggregate, the rolling of plain or precoated chips into newly laid surfaces, minimum crown and curve superelevation, and (on existing surfaces) use of a dressing compound with stone chips rolled in.

Roads in Undeveloped Countries

Premising central engineering planning and location with comprehensive system development in view it was recommended that:

> In countries of low density of population and where the construction of a large mileage of roads adequate even for light traffic is limited by the scarcity of available funds, it is deemed advisable to adopt the progressive system of construction by stages. Every endeavor should be made to insure that the initial alignment, grading, and subsequent surfacing should be such that all work executed should be capable of being utilized in the ultimate development of the road structure.
>
> It is desirable also that system research be undertaken to determine the physical properties of mixtures of clays and sands which constitute the natural soils, including soils containing hygroscopic salts, with a view to collecting useful data for the construction of earth wearing surfaces, appropriate for economic service in little developed regions having available few resources.

Observations on Suspended Matter in the San Juan River

Results of Studies Made in 1928 and 1929 on What Is at Times One of the Muddiest Rivers in the United States

By C. S. Howard and S. K. Love
U. S. Geological Survey, Washington, D. C.

During three months in the summer of 1929 the suspended load carried past the Goodridge gaging station on the San Juan River was more than 150,000,000 tons. This was more than half the quantity carried by the Colorado River past a station about 150 miles below the mouth of the San Juan, although the Colorado River at this station has approximately seven times the drainage area and discharge of the San Juan. During the past two summers intensive studies have been made of the suspended load on the San Juan and its changes with varying velocity and discharge. The fluctuations in suspended load are large and rapid; therefore at certain times the San Juan is one of the muddiest rivers in the United States, carrying a much higher percentage of suspended material than has been reported for the Mississippi, Missouri or other muddy rivers.

The San Juan rises among the high peaks of the San Juan Mountains in southwestern Colorado, flows southwestward into New Mexico, then swings to the west and northwest, passing across the extreme southwestern corner of Colorado into Utah. It joins the Colorado River about 138 miles below the junction of the Green and Colorado rivers and 78 miles above Lees Ferry, Ariz., and at its mouth has a drainage area of about 25,800

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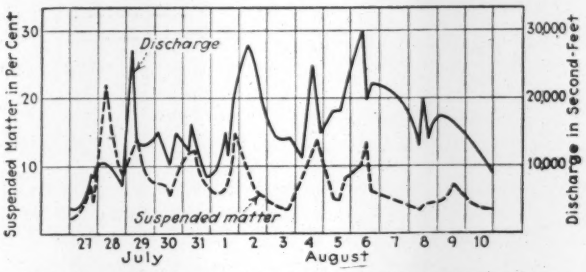


FIG. 1—DISCHARGE AND SUSPENDED MATTER FOR SAN JUAN RIVER, JULY 27 TO AUG. 10, 1929

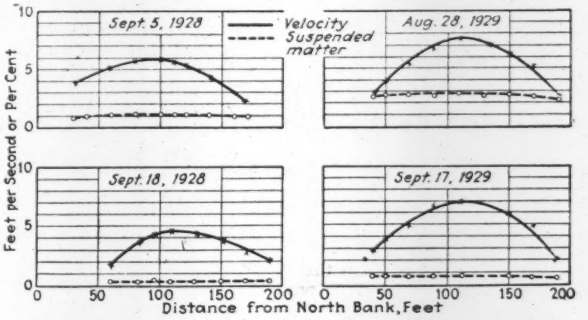


FIG. 2—VELOCITY AND SUSPENDED MATTER AT VARIOUS POINTS IN THE CROSS-SECTION OF THE SAN JUAN RIVER

square miles, which is approximately the same as the drainage area of the Little Colorado River at its mouth and of the Colorado above the Green River. The flow of the San Juan River was measured from 1895 to 1914 at gaging stations in the upper basin and from 1914 to 1917 and from 1926 to date at a station in the lower basin about 25 miles below Bluff, Utah. The mean annual discharge at the mouth is about 2,350,000 acre-ft.

For the determination of the quantity of suspended matter carried by the San Juan River, a systematic collection of samples was started in 1928 by the Geological Survey at the Goodridge gaging station about 25 miles below Bluff, Utah. Many samples were collected each day for a period in August and September, 1928; and since May 1, 1929, samples have been collected to secure a continuous record of the suspended matter carried past that station. The methods of sampling and computation are similar to those used at stations on the Colorado River.

Samples are collected each day and at frequent intervals on days when there is rapid fluctuation in discharge. Each of the numbers given in the tables and graphs represents an average of from three to seven determinations made as nearly together as possible at different points in the section. These averages, reported as percentage by weight, are used to compute the load at any time, and no calculations are based on single grab samples.

PER CENT OF SUSPENDED MATTER CARRIED BY THE SAN JUAN RIVER AT DIFFERENT RATES OF DISCHARGE

Date	Per Cent (by Weight)	Discharge, Sec.-Ft.	Date	Per Cent (by Weight)	Discharge, Sec.-Ft.
July 8, 1929.....	0.25	2,610	July 1, 1929.....	0.66	4,050
July 14, 1929.....	.65	2,300	Sept. 13, 1929.....	1.28	4,200
Sept. 3, 1928.....	1.90	2,200	Aug. 30, 1929.....	4.08	4,300
July 12, 1929.....	3.59	2,300	Aug. 31, 1928.....	5.64	4,600
July 17, 1929.....	.68	8,320	Aug. 13, 1929.....	6.20	25,000
Aug. 13, 1929.....	4.11	7,800	Aug. 12, 1929.....	7.74	42,500
July 28, 1929 1 p.m.	13.6	8,000	July 29, 1929.....	13.8	16,500
7 a.m.	22.2	8,000	Sept. 21, 1929.....	40.8	19,000

During the two years of this study the discharge and quantity of suspended matter showed large variations. In the summary of 1928 the mean daily discharge ranged from about 400 to a little more than 2,000 sec.-ft., with an average of 780. The mean quantity of suspended matter for this period was 1.57 per cent and the mean daily load was 37,000 tons. In the summer of 1929, because of heavy rains, the discharge ranged from 1,600 to 40,000 sec.-ft., with a mean of about 8,000. For the 1929 samples the mean quantity of suspended matter was 7.30 per cent and the mean daily load was more than 1,500,000 tons.

The discharge and quantity of suspended matter change rapidly during the summer and early fall. The fluctuations during a period of fifteen days in the summer of 1929 are shown by Fig. 1.

At times the changes in discharge and quantity of suspended matter were more rapid than is indicated by the graphs. During a rise in stage of 4.8 ft. in one hour on Aug. 13, 1928, the suspended matter increased from 1.1 to 4.1 per cent and at the end of another hour was 5.1 per cent, although the stage had fallen below the maximum. In a rise of only 1.2 ft. in two hours, Aug. 1, 1929, the suspended matter increased from 8 to 15 per cent. A sudden flood on Sept. 21, 1929, caused a rise of 6.8 ft. between 2 and 4:30 a.m., with a fall of 1.3 ft. in the next three hours. The average quantity of suspended matter on the morning of Sept. 20 was 0.44 per cent. The average of three determinations across the section at 7:30 a.m. on Sept. 21 was 40.8 per cent, and at 2:45 p.m. was 21.1 per cent.

In general, the river carries larger percentages of suspended matter with greater volumes of discharge, but the quantity carried at any given discharge may cover a wide range, as is shown by the accompanying table.

During changing stages of the river, soundings made from the cable showed shifting of the riverbed throughout the section. On July 29, 1929, the river fell a foot in five hours and the bed of the river at one point was lowered 3 ft. During the next fourteen hours the riverbed was lowered 1 ft. at this point and in the next six hours had been raised 1.3 ft. Between Aug. 10 and 13, 1929, the riverbed was lowered 3 ft. at one point but by the 17th was at the level it had on the 10th.

On several days a velocity measurement was made immediately before the collection of the sample. The curves in Fig. 2 show the quantity of suspended matter and the velocity at various points in the cross-section and are typical of the results obtained in 1928 and 1929.

The velocity varied considerably at the different sampling points but the percentage of suspended matter was quite consistent throughout the cross-section during a given sampling period. For example, the curves for Aug. 28, 1929, show that for a velocity of 2.68 ft. per second at the 190-ft. point the percentage was 2.34 and for a velocity of a 7.48 ft. per second at the 110-ft. point the percentage was 2.90—only a slight increase in suspended matter for a large increase in velocity.

The quantity of suspended matter carried by the San Juan River at a given time appears to be determined not by the velocity or the discharge but by the supply and nature of the material. The flash floods from heavy rains on certain parts of the drainage area carry much larger loads of suspended matter than do equal discharges during the normal flow of the river. These varying factors prevent the prediction of any general relation between the quantity of suspended matter and the discharge, and make frequent sampling essential.

Engineering Literature

A Monthly Review of Books and a Listing of New Publications

Mostly on Roman Engineering

ENGINEERING [Our Debt to Greece and Rome Series]—By Alexander Purves Gest, C.E., Rensselaer Polytechnic Institute. New York: Longmans, Green & Co. Cloth; 5x7 in.; pp. v-xiii —221. $2.

WRITTEN to fit into a long series of books designed to show people of an inquiring mind what they owe to Greece and Rome and well adapted to that purpose, this book will serve equally well to introduce the engineer to Greek and Roman engineering. In fact, it will give most engineers all they want to know on the subject, unless it be in their own specialty. For those who wish to go further, a list of more than 70 works, from Frontinus on the water supply of Rome and Vitruvius on architecture down to the present day, thus spanning twenty centuries, will suffice. Beyond this, it should be said that for either the lay or the technical reader the fact that the book is by an engineer who appears to be well versed in the classics should be a strong recommendation. A brief introduction is provided by Prof. William H. Burr, who nearly 30 years ago wrote a book on Ancient and Modern Engineering.

After sketching in his background, Professor Gest reviews Early Engineering Works, chiefly those of Egypt, Assyria, Carthage and Greece. He then deals with Greek and Roman Engineers. Of the former and their works there is little to be said, although the Romans and all later nations owe a great debt to Greece for their work in mathematics and in scientific theory. The body of the book takes up Materials and Methods of Construction, Aqueducts, Roads, Bridges and Tunnels, Cloacae, Canals, Reclamations and Harbors. Ten pages are devoted to The Continuance of the Roman Tradition After the Fall of the Empire.

Although buildings do not appear in the list of contents just cited (there is a separate volume on Architecture in the series), they do enter into the book, chiefly under Materials and Methods of Construction. Irrigation, flood control and power development have at least incidental mention. Thus altogether the Romans built most of the great classes of public works now current—and placed them over a large part of the world.

Why the author did not supply translations to all of his quotations from the Latin classics is a question. It should be done for the second edition; and for that, too, an index should be provided.

The book might well find a place in the library of every engineer. Every engineering student, at least in civil engineering, could read it profitably once or twice during his college course.

Legal Aspects of Surveying

THE LEGAL ELEMENTS OF BOUNDARIES AND ADJACENT PROPERTIES—By Ray Hamilton Skelton, C. E., Assistant Professor of Civil Engineering, University of Maryland. Indianapolis: The Bobbs-Merrill Co. Imitation leather; 5½x8¼ in.; pp. v-1x and 1-580; tables and text illustrations. $5.

DESCRIBING and locating tracts of land, the primary functions of the surveyor, are tasks which require a knowledge not only of the mathematics of surveying but also of a mass of legal precedent which has been accumulating for centuries. The location of land boundaries must be made in accordance with certain basic legal principles, for each description must be written and every land survey made with the possibility of court scrutiny in mind. For the benefit of surveyors and lawyers alike, the author has compiled in this volume a general summary of these basic legal principles and a discussion of the accepted rules to be followed in interpreting imperfect or questionable descriptions. To lend authority, several hundred court rulings and decisions are quoted, illustrating how legal principles have been applied by American courts. The task undertaken by the author was a difficult one and has been well handled. The book should prove a useful source of reference to anyone engaged in land surveying.

Construction Cost Estimating

REVIEWED BY ALFRED T. GLASSETT
Barney-Ahlers Construction Corporation, New York City

ESTIMATING CONSTRUCTION COSTS—By G. Underwood, Construction Engineer. New York and London: McGraw-Hill Book Co. Flexible; 6x9 in.; pp. 620; halftones, tables and many line cuts. $6.

IN GENERAL, there are two classes of construction estimates; those prepared for appropriation purposes on either a square-foot or cubic-foot basis, and those prepared by computing the quantities involved and appropriate unit prices therefor. Mr. Underwood's book has been prepared for the latter type of estimate. He presents in a series of almost 500 charts unit costs for use in preparing detailed estimates covering not only such items as excavation, concrete work, masonry, etc., but also items usually subcontracted such as heating, plumbing and electrical work. In addition, there is a chapter on transportation of materials, which provides unusual and valuable information on freight rates between different points, a chapter on the prices of construction materials in the vicinity of New York, and a chapter on job overhead.

The method of presenting the costs in chart form is new. For each operation involved there are two or three paragraphs of explanatory material which assume a rate of work for certain conditions, accompanied by a chart from which the unit prices may be obtained for any given rate of wages. As a result, almost half of the book is devoted to straight-line graphs, the labor-saving value of which is far too little to compensate for the space involved. For a given territory, the variation in efficiency of labor has more effect on construction cost units than changes in the rate of wages. It would seem that much of the space devoted to these charts could have been more advantageously used for further discourse of the range in the productivity of labor for various kinds of work under different conditions.

We must presuppose that anyone preparing an estimate has a thorough knowledge of construction and experience in estimating costs. While the units given in this book are high for present market conditions, units under one general heading are usually in proportion so that, intelligently used, unit costs for items new to the esti-

mator may be interpolated from known current actual costs of items under the same classifications.

The book is very broad in scope, covering most classifications of construction, and is particularly thorough in its chapters on transportation of materials, handling of materials, excavation and masonry. The chapters on concrete and overhead are incomplete, many items common to most buildings being omitted. The chapter on price of construction materials might be of use in preparing approximate estimates, but, under changing market conditions, will probably have but slight permanent value.

British Practice in Bridge Building

REVIEWED BY LEWIS E. MOORE
Consulting Engineer, Boston, Mass.

MODERN BRIDGE CONSTRUCTION: A Treatise Setting Forth the Elements of Bridge Design and Illustrating Modern Methods of Construction—By F. Johnstone Taylor, Author of "Water Power Practice," "River Engineering," etc. London: Crosby Lockwood & Son. Cloth; 6x9 in.; pp. 235; halftones, line cuts and tables.

THIS book does not purport to be an exhaustive treatise on bridges, but rather a general view of the subject presented in a way which will serve the needs of those who require some knowledge of the subject but who do not intend to specialize in bridge work. It is an English book which the author states is intended to give a sufficiently good grounding to meet the requirements of professional examinations. Higher mathematics is avoided as much as possible with the rather apt remark that "a knowledge of mathematics is of less value to the engineer than a gift of expression."

The book begins with the principles of masonry arches and gives examples of several bridges, describing certain features of construction that perhaps would not occur to one outside the expert field. Steel sections follow with a brief epitome of the usual methods of computing beams. Their use as columns or "stanchions" is also briefly outlined. As an indication of the length of treatment accorded the different types of bridges, some six pages are devoted to plate girders; and the subject is handled in such a way that the reader will have a pretty good idea what a girder looks like, the arrangement of the different parts, and how some of them are computed, although the method of computing flange rivet pitch is not mentioned.

Truss bridge construction is next taken up with a number of general examples and illustrations of types and brief descriptions of methods of computing certain essentials, but by no means enough to enable one to make more than a sketchy design. Constructional details, such as types of flooring, expansion rollers, arrangement of certain joints, etc., follow. Steel arches and swing bridges are considered. The idea expressed by the author that the end wedges of a draw span should be designed to lift the whole bridge until the center pivot clears its bearing by at least the maximum calculated deflection of the whole truss under load is certainly not in accord with American practice and would be most uneconomical even if it were a practical possibility. Bascule bridges are touched upon and then erection and field work, including foundations, are given about 36 pages. Ferro concrete and suspension bridges complete the work.

Although there are certain minor discrepancies, one or two of which are noted above, the author has succeeded very well in giving a comprehensive general view of British practice in bridge building.

How to Be a Super-Secretary

THE SECRETARY'S GUIDE TO CORRECT MODERN USAGE—By C. O. Sylvester Mawson, Litt.D., Ph.D., Head of the Mawson Editorial School, Boston. New York: Thomas Y. Crowell Co. Cloth; 6x9 in.; pp. 224; $2.

ALTHOUGH this book, by its title, purports to be a guide for secretaries to business men, it is much more than that; it is also a manual indicating how copy should be edited and prepared for the printer and includes instruction in reading proof. The author says in his preface that it is the aim of the book to help the secretary in mastering the various details of sentence construction and to enable her to produce letter after letter in a finished and business-like manner, so that her work shall become a credit to herself and a valuable asset to her employer. He also postulates that the modern secretary must not only know how to write letters, but, in many instances, be able to prepare copy for the printer and read proof.

Only one chapter, on Business and Formal Correspondence, is devoted to letter writing *per se*. The rest of the book treats of typographical style, spelling, compounding of words, division of words, capitalization, punctuation, abbreviations, use of figures and numerals, sizes and styles of type, use of italics, spacing, indention, preparation of manuscript, proofreading and purity of diction. While much of the information given is applicable to the work of all secretaries, the book is evidently intended for the secretary who would increase her usefulness and open up positions which would otherwise be barred to her.

The information in the book is sound. Without attempting to give an exhaustive treatise of his subject, the author has covered the high spots adequately and the secretary who studies the book diligently and afterward keeps it handy for frequent reference must attain greater efficiency, which will show in her work and, it is hoped, in her pay check.

Planning for 20,000,000 People

MASTERING A METROPOLIS: Planning the Future of the New York Region—By R. L. Duffus. New York and London: Harper & Brothers. Cloth; 5¾x8¼ in.; pp. 302; halftones and maps. $3.

THE biggest, boldest and most costly city and regional planning enterprise ever undertaken and the one that offers the greatest future potentialities was recently completed after years of work by a small army of engineers and other specialists in city planning. Hundreds of less extensive planning studies have come to little or nothing beyond maps and reports, because they are voluntary efforts, in no way tied in with governmental agencies and never won public support. The same danger threatens the work of the Committee on the Regional Plan of New York and Its Environs. The danger is many times increased because within the district concerned there are more than 400 cities, towns and villages, located in three states, each one of which needs to be enlisted to prevent the work of the committee from falling dead. What is needed is co-operation throughout the whole district. That means wide public support, which can be had only by bringing the committee's plan home to the people in the district.

One means to further that end has been the preparation by the masterly pen of R. L. Duffus of an outline of the plan and its significance; a condensation into a single relatively small volume of the ten quarto volumes brought out in the past few years by the committee. The result is a readable, well-illustrated book which tells the story

of planning for the 20,000,000 people that it is estimated will be living in the district in 1965, and how the adoption of the plan may be furthered. The book should find many thousands of readers not only within New York and its environs but also among city planners and dwellers in all parts of the world.

The Economics of Contracting

ALLGEMEINE BAUBETRIEBSLEHRE—Von Maximilian Soeser, Zivilingenieur, Dozent für Baubetriebslehre an der Technischen Hochschule in Wein, Öffentlicher Gesellschafter der Bauunternehmung H. Rella & Co., Wien. Wien and Berlin: J. Springer. Cloth; 6x9 in.; pp. 277; halftones, line cuts and tables. 18.6 marks.

THE fundamental principles underlying all successful contracting—sound technology and sound economics—are admirably set forth in the latest addition to the list of German technical books. After 25 years spent as manager of a contracting firm the author is now lecturing at the Vienna Technical College. An introductory paragraph explains the economic background of present-day contracting, and then the book takes up the question of legislation and co-operative plans now in use to protect the economic position of labor. In view of the current publicity given to this question in our own country, this chapter is of special interest. Construction machinery is discussed in a broad general way, with much attention given to cost-accounting methods. Excavating and earth-moving equipment, concrete mixers and machinery for preparing concrete aggregates are all given separate chapters. The most noteworthy feature of the book is the emphasis it places upon general economic considerations.

Depreciation of School Buildings

ACCOUNTING FOR DEPRECIATION OF SCHOOL BUILDINGS—By George Stephen Murray. Published by the Author, 23 Judson Ave., New Haven, Conn. Paper, cloth back; pp. (mimeographed) 42. $1.

THAT a large percentage of taxation goes for schools is well known by all who have tried to inform themselves on the apportionment of the municipal "tax dollar." Large as is the percentage usually given, it rarely tells the whole story, for often capital charges are omitted from payments for schools, perhaps to be added, in part, to a lump sum entry of bond interest and redemption payments for the entire municipality. Payments on bonds retired in previous years and depreciation of school buildings and other more or less permanent plants are, as a rule, completely ignored. Mr. Murray has brought together in condensed but clear and logical form a series of documented notes showing the importance of allowing for depreciation and citing court and other opinions on what depreciation should include. He also presents some data for computing the value of buildings, with an illustrative example.

What Cities Can and Cannot Do

FEDERAL LIMITATIONS UPON MUNICIPAL ORDINANCE-MAKING POWER—By Harvey Walker. Columbus, Ohio: The Ohio State University Press. Cloth; 6x9 in.; pp. 207; $3.

MANY engineers are much concerned with municipal ordinances; often in drafting them, but particularly with what cities and villages can and cannot do without running against a barrier imposed by the Constitution of the United States. Such engineers, and also city councilmen and administrative officers, will find in this volume a readable review of scores of rulings of the United States Supreme Court on what cities can and cannot do. These are grouped mainly under decisions based on the commerce and the contract clauses of the Constitution and on the due-process-of-law provision of the Fourteenth Amendment. They are further classified under such heads as commerce, navigation and various elements of the police power. More specifically, as regards public works and activities, wharves, ferries, bridges, height of buildings and zoning generally, garbage and sewage disposal and water rates are among the cases summarized. An apparently justifiable claim for the book is that, besides covering some twenty additional years, the volume is far less bulky and costly than the standard works of Dillon and of McQuillan on municipal corporation law.

Sanitary Control of the Ruhr Valley

DER RUHRVERBAND—Von Dr.-Ing. K. Imhoff. Berlin W. 8, Germany: Carl Heymanns. Stiff paper; 8x12 in.; pp. 62; folding maps in colors, line cuts and many halftones.

THE 1930 edition of Dr. Imhoff's descriptive report of the activities of the Ruhr Association is the third to be issued and brings down to date the work being done to maintain proper sanitary and hydraulic conditions in that river. The pamphlet is profusely illustrated with halftone reproductions and drawings and includes an attractive map of the river's drainage area. Of the three main sections into which the report is divided, the first gives a general description of the Ruhr district in regard to its topography, its population and its sanitary problems. The second part describes the history of the Ruhrverband and its organization. The engineering structures built by the association and their maintenance and operation are described in detail in the third section.

Publications Received

INFORMATIVE BOOKS FOR THE LAY READER by noted authorities on astronomy, economics, history, travel, anthropology and psychology have been added to the lists of McGraw-Hill Book Co. (370 Seventh Ave., New York City). Whittlesey House Publications is the title page imprint.

INTERNAL DISTURBANCES IN CHINA account for the delay until now of the appearance of the Statistics of Railways for the year 1926, compiled by the Bureau of Railway Statistics, Ministry of Railways (Nanking, China). K. F. Mok is director of the bureau. The figures given are almost wholly financial, and are in dollars. The text is printed in both English and Chinese.

STANDARD SPECIFICATIONS for Vitrified Brick Pavements, as adopted by the American Society for Municipal Improvements by letter ballot on Jan. 30, 1930, and for Paving Brick, as adopted by the American Society for Testing Materials (date not given), have been printed in a single pamphlet and may be had for 25c. from the National Paving Brick Manufacturers' Association, Washington, D. C.

IRRIGATION in the eastern part of the United States is practiced more extensively than most people realize, but not as much as it might be with profit. Reasons for doing it, a statement as to why, when done, the water should be applied directly to the surface rather than sprayed on from above or piped in beneath, and detailed methods of the preferred practice are given in a bulletin, Surface Irrigation in the Eastern States, by F. E. Staebner, associate drainage engineer, U. S. Department of Agriculture. (10c. from Superintendent of Documents, Washington, D. C.).

UNUSUAL STUDIES OF TWO RIVERS in California over a period of five years are included in a 413-p. volume entitled Report of Sacramento-San Joaquin Water Supervisor, 1924-28, by Harlowe M. Stafford, who held the office just named. Besides detailed streamflow records for a number of stations the volume takes up return flows to the streams from lands under irrigation and also water applied to and crop yields from several kinds of

plants grown in natural soils inclosed in tanks with perforated bottoms, placed in larger tanks, water for plant growth being applied to the annular space between the two tanks. The report is also unusual in that it deals with the effect of water diversions for irrigation on the navigability of the Sacramento and on salinity in the tidal portion—from which water is diverted for rice culture.

A CATECHISM on the Boulder Canyon project, which is estimated to cost $165,000,000 and includes a dam of record-breaking height, has been issued by the U. S. Reclamation Service, Washington, D. C. In nine mimeographed pages much information is given regarding the dam and reservoir, power plant, water allocation, river flow, irrigable areas, town site near the dam to house workers on construction, All-American canal, and the Imperial and Coachella valleys to which the canal will deliver water. Engineers, engineering and other libraries will find the circular well worth adding to their reference files.

ONE DOLLAR will buy the comprehensive report on the New England flood of November, 1927, prepared by the Committee on Floods of the Boston Society of Civil Engineers, which fills 159 pp. of the September *Journal* of that organization (Tremont Temple, Boston, Mass.). The report first deals with the flood, the rainfall which caused it and the resulting damage. Next, previous notable storms in New England are reviewed. The report then takes up flood factors, formulas and characteristics for New England. Nearly 30 pages are devoted to flood-prevention measures. Conclusions of the study are summarized thus at the end of the report: " . . . the general solution of the flood problem here in New England appears to be the development of the power reservoir systems, encouraged by helpful legislation."

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

BONDING NEW CONCRETE TO OLD—By Norman Davey, B.Sc., A.M.Inst.C.E. Building Research Bulletin No. 9. British Department of Scientific and Industrial Research. London: His Majesty's Stationery Office. New York: British Library of Information, 5 E. 45th St. Paper; 6x10 in.; pp. 4; 3 illustrations. 3d.

CITY NOISE: Report of the Commission Appointed by Dr. Shirley W. Wynne, Commissioner of Health, to Study Noise in New York City and to Develop Means of Abating It. New York: Noise Abatement Commission, Department of Health. Paper; 6x9 in.; pp. 308; halftones and line cuts.

Perhaps the most comprehensive report on the subject ever published. Among the members of the commission were Lewis H. Brown, President, and E. B. Dennis, Acoustical Engineer, Johns-Manville Corp., who served as president and secretary to the commission; Albin H. Beyer, Professor of Civil Engineering, Director of Testing, Department of Civil Engineering, Columbia University, and Alfred H. Swayne, Vice-President General Motors Corp.

COMMERCIAL A.C. MEASUREMENTS—By G. W. Stubblings, B.Sc. (Lond.) F.Inst.P., A.M.I.E.E. New York: D. Van Nostrand Co., Inc. Cloth; 6x9 in.; pp. 325; many illustrations. $6.

A British book "in which," the author states, "the theory and practice of the measurement of current, voltage, power, energy and power factor in a.-c. currents is dealt with fairly exhaustively." Designed "primarily for testing engineers and senior students," but the author hopes the book will appeal "generally to engineers engaged on the technical side of the electrical industry." The "mathematics have been kept as simple as possible."

DIE BERECHNUNG AUF VIER SEITEN GESTÜTZTER RECHTECKIGER PLATTEN—Von Dr. Takashi Inada, Professor an der Kaiserlichen Kyushu Universitat, Fukuoka, Japan. Berlin: Julius Springer. Paper; 7x10 in.; pp. 17; 12 line cuts.

On the design of plates supported on four sides. Includes report of a test carried out in 1923.

FACTS AND FIGURES OF THE AUTOMOBILE INDUSTRY, 1930 EDITION. Paper; 6x9 in.; pp. 96; tables and line cuts. National Automobile Chamber of Commerce, 366 Madison Ave., New York City.

FOUNDATIONS FOR HUMAN ENGINEERING—By Charles R. Gow, Professor of Humanics at the Massachusetts Institute of Technology. Edited by F. Alexander Magoun. New York: The Macmillan Co. Cloth; 6x8 in.; pp. 226. $1.60.

A HANDBOOK OF ENGLISH IN ENGINEERING USAGE—By A. C. Howell, Associate Professor of English, University of North Carolina. New York; John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; pp. 286. $2.50.

THE MEASUREMENT OF HYDROGEN ION CONCENTRATION—By Julius Grant, Ph.D., M.Sc. (Conn.), A.I.C. London New York and Toronto: Longmans, Green & Co. Cloth; 6x9 in.; pp. 159; illustrations and diagrams. $3.75.

METHODS FOR ABATEMENT OF THE POLLUTION OF THE RARITAN RIVER—Report to the Port Raritan District Commission, by the Engineers, Remington, Vosbury & Goff, Camden, N. J.; Associates, Harry N. Lendall and Dr. Willem Rudolfs. Paper; 8x11 in.; pp. 83; halftones and maps, some folding. C. S. Atkinson, Secretary, 390 George St., New Brunswick, N. J.

MODERN SEWAGE DISPOSAL AND HYGIENICS: Being a Treatise on the Subject of Sewage Disposal With Details of Present Day Practice; Outlining the Requirements of the Ministry of Health Regarding Works for the Purification of Sewage—By S. H. Adams, Assoc.M.Inst.C.E. London: E. & F. N. Spon, Ltd. New York: Spon & Chamberlain. Cloth; 6x9 in.; pp. 473; tables, graphs and illustrations. 25s. net.

MOTOR VEHICLE ACCIDENTS IN CONNECTICUT (Sixth Study), Including Those for the Year 1929—By Richard Shelton Kirby, Associate Professor, Department of Civil Engineering, Yale University; Introduction by Robbins B. Stoeckel, Commissioner of Motor Vehicles, State of Connecticut. New Haven: Published for the Hartley Corporation by the Yale University Press. Paper; 6x9 in.; pp. 43; charts.

A PRACTICAL TREATISE ON MAPPING AND LETTERING, Including the Construction of the Basic Alphabets and the Elements of Map Design—By Malcolm Lloyd. Philadelphia: P. Blakiston's Sons & Co., Inc. Flexible; 11x8 in.; pp. 58, including plates. $2.50.

Intended "as manual for the engineer and draftsman, and as a textbook for teacher and student . . . the outcome of a long experience and obervation." Besides the more common features, takes up photo reproduction, colors and their use, tinting, map mounting and plaster relief models.

RESULTS OF PHYSICAL TESTS OF ROAD-BUILDING ROCK—Compiled by D. O. Woolf, Associate Materials Engineer, Division of Tests, Bureau of Public Roads, U. S. Department of Agriculture. Paper; 6x9 in.; pp. 148. 35c. from Superintendent of Documents, Washington, D. C.

Tabulation of tests of about 6,000 samples arranged alphabetically by states and cities or towns.

SHADES AND SHADOWS FOR ARCHITECTS—By Richard S. Buck, Jr., C.E., B.Arch., Assistant Professor of Architecture, assisted by Wilbert C. Ronan, C.E. in Arch., B.Arch., M.A.I.A., Professor of Architecture, Ohio State University, and Galen F. Oman, B.Arch.Eng., B.Arch., M.A.I.A., Assistant Professor of Architecture, Ohio State University. Edited by Thomas E. French, M.Am.Soc.M.E., Professor of Engineering Drawing, Ohio State University. New York and London: McGraw-Hill Book Co. Cloth; 9x12 in.; pp. 134; line cuts. $3.

THE TECHNICAL ARTS AND SCIENCES OF THE ANCIENTS—By Alfred Neuburger. Translated by Henry L. Brose, M.A., D. Phil. (Oxon.). [Originally published in German as Die Technik des Altertums.] New York: The Macmillan Co. Cloth; 7x10 in.; pp. xxxii + 518; 676 halftones and line cuts. $10.

TECHNO-DICTIONARY, English-German-Italian: A Collection of Technical Terms From Metallurgical, Foundry, Factory and Workshop Practice, for the Readers of Foreign Technical Periodicals. Second Edition. Hubert Hermanns, author and publisher, Berlin-Lichterfelde, Germany, Dahlemer Strasse 64A. Paper; 4x6 in.; pp. 411. $3.75 to American purchasers.

In three parts, each giving the same technical word or term in three languages. Limited, as the subtitle states, but includes some civil engineering terms.

TRANSPORTATION ON THE GREAT LAKES (Revised 1930)—Prepared by the Board of Engineers for Rivers and Harbors, War Department, and the Bureau of Operations, U. S. Shipping Board. Paper; 6x9 in.; pp. 423; tables, halftones, folding and other maps, some colored. $1.50 from Superintendent of Documents, Washington, D. C.

First published in 1923; contains data for calendar year 1928.

TYPICAL EXAMPLES OF THE ENGINEERING WORK of Fay, Spofford & Thorndike, Engineers, 44 School St., Boston, Mass. Paper 12¼x9¼ in.; pp. 4; 14 halftone plates.

Short paragraphs on 45 bridges, water supply, sewerage, port terminal, building and miscellaneous projects, with views of some of them.

UNIFORM BUILDING CODE, 1930 EDITION: Adopted by the Pacific Coast Building Officials' Conference at the Sixth Annual Meeting, October, 1927, with Revisions and Additions Approved at the Eighth Annual Meeting, September, 1929. Paper; 5x8 in.; pp. 271; tables. Pacific Coast Building Officials Conference, 19 Pine Ave., Long Beach, Calif. $1.

UNION SCALES OF WAGES AND HOURS OF LABOR, MAY 15, 1929—Bulletin of U. S. Department of Labor. Paper; 6x9 in.; pp. 338. 50c. from Superintendent of Documents, Washington, D. C.

WATER POWER AROUND THE WORLD, 1930—By S. L. R. Hollis, A.M.Inst.Mech.E., Assoc.M.Inst.E.E. A trade publication in the interests of Ferrum of Karowice, Poland, designers, manufacturers and builders of high-pressure pipe lines for hydro-electric plants. Export office, Aktien Gesellschaft, Linkstrasse 27, Berlin W. 9, Germany. Boards; 8x10 in.; pp. 245; 2 maps, many halftones and 2 line cuts of pipejoint details. Free on application.

Although this is a trade publication, it falls in the class, happily increasing in numbers, which gives much information of general interest within its field. Many important hydro-electric installations are described and handsomely illustrated. These are grouped by countries—for which summaries of power developments are given. At the end of the volume there is chronological table of hydro-electric plants, "the pipe lines of which have been supplied by Ferrum," giving heads, diameters, lengths and number of lines. The publication of the book in English is a creditable enterprise.

WISCONSIN LAKE AND STREAM SHORE PLATTING AND SANITATION CODE: Rules and Regulations of the Wisconsin State Board of Health. Paper; 6x9 in.; pp. 59; halftones, line cuts and tables. Madison, Wis.: State Board of Health.

Covers "platting of land, size of lots, width of streets, building requirements, restrictions as to low land, water supply, toilets, waste disposal and general sanitation of premises, together with laws and explanations, legal opinions, suggestions and information for the better protection of public health and to promote the general welfare."

THE WONDERFUL STORY OF INDUSTRY—By Ellen Friel Baker, illustrated by Carle Michel Boog. New York: Thomas Y. Crowell Co. Cloth; 6x9 in.; pp. 308; colored frontispiece; group of sketches for each industry. $2.50.

Twenty-five stories of as many industries written to help "the young boy to a better understanding of the world of industry." Among the topics are the Newspaper, Paper, and Iron and Steel.

Letters to the Editor

A Forum for Discussion of Views of Engineers and Contractors

Stop Signs and Routing of Traffic

Sir—The average stop sign used to control traffic in cities is of many designs and is placed at many different points at the intersections. Some cities use the suspended design; others, the same sign on a standard at the center of the intersection; while others place the sign at the corner of the intersection. Still others are placed on posts in street centers, and I know of one city which uses three different types to control traffic in various parts of the city.

Some of the suspended type are placed so high that the only knowledge that the automobile driver nearest the intersection has that the light has changed is the action of the drivers on the opposite side of the street. Some cities allow trucks and buses to unload at the corners, so that part of the time the signs which are placed at the corner of the intersection are obscured.

All of this tends to confuse the automobile driver who is unfamiliar with the city. Because of the great amount of interstate traffic on busy city streets, it seems to me that these traffic signs should be standardized in the same degree that railroad signs have been standardized in the past. In fact, I think it is of greater necessity that they be so standardized, for the reason that railroad employees on the whole feel their responsibilities to a greater extent than the average automobile driver.

On account of the many kinds of traffic that use city streets, such as large vans, street cars, etc., which on a great many streets have limited clearance between tracks, the sign at the center of the intersection must give way to one at the corners, for while in nearly all such cases the suspended type could be used, because of the great amount of clearance required it would have to be placed so high that the car driver would have difficulty in seeing it.

I believe that all stop lights should be placed at corners and at a standard height and that the police department should enforce ordinances to stop the obscuring of signs due to street cars, buses, etc., unloading so near to them that they would not be readily visible to drivers of automobiles.

Where state and federal highways traverse a city street which uses stop lights to control traffic, I believe that traffic could be speeded up to a great extent by the use of illuminated highway numbers placed on top of the lights to control traffic. In this way the driver unfamiliar with the city would not have to look for two different signs at two different places; and where standards are used for street illumination, the highway numbers should be placed on an illuminated sign on these. The average highway sign in a city is obscured for the most of the time by parked cars, and nothing tends to slow up traffic so much on a busy street as a driver unfamiliar with the highway routing.

I believe that the next development in traffic control should consist of bypassing through traffic around a city. In the early days of automobile traffic every city wanted all the automobile traffic to traverse its main streets for commercial purposes. This was a very good idea several years ago, but it is now obsolete. Traffic is now so dense that the automobile driver could not stop if he cared to do so without leaving the business section of the city to find a place to park his car. The commercial traffic in a city is itself now so great that the tourist is obstructing the necessary commercial activities of the business districts of the cities.

Where topographical conditions are such that it can be readily done, I think it is the duty of both the city and the state highway departments to route all through traffic around cities by means of an outer belt boulevard completely around the city. In most cases this would mean a greater mileage than to traverse the city proper, but it would certainly consume less time to drive the extra mileage than to traverse the congested city streets.

Going a step further, when such an auto drive is designed, I think that sufficient right-of-way should be obtained; that a setback lime be established so that in the future such a drive may be readily widened for extra lanes of traffic. And also, when designing such an outer drive, that due consideration be given to grade separation of all traffic from the city to outlying suburbs or other cities near by which furnish a large local traffic.

In closing, let me state that I believe that city engineers and heads of state highway departments should start at once to make plans to bypass all important cities which are on main highways of the state, and that the cost thereof be divided very nearly equally between the state and the city. For it would be of as much benefit to the city to relieve congested traffic conditions as it would to the state to speed up traffic on the highways and to eliminate what is known as "bottleneck congestion." But until it is possible to bypass traffic away from congested city streets, I am sure that traffic could be speeded up, to a great extent, by the standardization of all stop signs and by placing highway signs at the same points, so that the automobile driver would not have to slow down in order to follow highway markings.

Clarinda, Iowa, Sept. 1, 1930. W. P. Norris, County Engineer, Page County.

Licensing Contractors to Restrict Competition

Sir—Inasmuch as one of the leading editorials in *Engineering News-Record* of Aug. 7 ("Contractors' Licensing Experience," p. 197) carried an implication of indorsement of the principle of restricting to the uttermost participation in the business of contracting, the writer craves the privilege of inviting attention to the fact that in doing so the leading civil engineering journal of America is doing its bit to promote the spread of that scourge of modern Amercan civilization, bureaucratic government.

It is a deplorable fact that although our legislators assume to represent wholeheartedly the general public interest, they actually prefer to pose as purveyors of special privilege, restrained only in cases where opposing special interests become sufficiently vocal to attract general public attention. It can confidently be asserted that occupational restrictions have been imposed upon the public only because the few self-seeking or socialistically minded proponents, practically always with an ulterior motive, are organized while the rank and file of the people, leaving their political representatives out of it, are not represented and, in fact, are generally ignorant of what is going on.

For example, the real motive behind the campaign of licensing contractors is not, as is generally stated, to promote safe construction but to diminish competition.

I would respectfully challenge its advocates to name a single case in which such restrictive legislation was initiated or actively advocated by public welfare organizations or other representative agencies in behalf of the general public.

I would challenge them to cite a single instance in which the promoters of such restrictive legislation did not undertake to conceal their underlying purpose by gratuitously assuming the role of protectors of the public health or safety.

I would challenge them to discover any case in which restrictive legislation was justified by a record of structural failures attributable to incompetence on the part of contractors involved so obvious that they would certainly have been excluded had such legislation been in force when the work was undertaken.

I would challenge them to submit any tangible evidence that the public has been benefited by restrictive legislation of this kind.

I would challenge them to adduce statistical evidence that the public welfare in certain states has suffered by comparison with other states because of lack of restrictive legislation even with respect to doctors and lawyers.

Invoking police power in behalf of anything not vital to the comfort, health and safety of the people is undemocratic and un-American, and the writer can only express regret that industrial organizations should have recourse to such action in an effort to retain the support of their individual members and that your esteemed journal should meekly fall into line with such a program.

San Francisco, Calif., Sept. 17, 1930. E. T. Thurston, Consulting Engineer.

News of the Week

Comprehensive Plan Made for Sewerage in the Atlanta District

INTERCEPTING sewers, sewage-works and storm-relief sewers at a total estimated cost of $13,786,400 for a proposed metropolitan sewerage district including Atlanta, Ga., with an estimated population in 1965 of 800,000, are recommended in a report presented to the mayor and city council by Whitman, Requardt & Smith, Baltimore, Md., with whom are associated Robert & Co., of Atlanta. The area covered by the report is 175 square miles and embraces territory which, by the state legislature of 1929, was designated as the city of Atlanta, including Atlanta, Decatur, Hapeville, College Park, East Point and Avondale, and fifteen unincorporated communities.

Aside from several septic tanks, few of these places have sewage-works. Atlanta has three old plants, while College Park and Avondale each has a small plant. Of Atlanta's three existing sewage-works each consists of coarse screens, grit chambers, Imhoff tanks and sprinkling filters, built after plans by Hering & Fuller. Dates of completion and capacities are: Proctor Creek, 1912, 3 m.g.d.; Peachtree Creek, 1913, 8 m.g.d.; Intrenchment Creek, 1914, 5 m.g.d. (For illustrated descriptions see *Engineering News*, first half of 1912, p. 471.) The present report advises the abandonment of the Proctor and Peachtree plants and the building of a new plant to be located on the east bank of the Chattahoochee River. The Intrenchment Creek plant would be retained and supplemented by a second plant, farther down on South River. The single plant retained, and the two new ones mentioned, would handle the bulk of the sewage of the proposed district. A third, and relatively small, new plant is recommended on Camp Creek. All three of the new plants would provide sedimentation, separate sludge digestion and trickling filters. The settling tanks would be equipped with mechanical sludge removal apparatus.

In addition, the report proposes three temporary plants to consist of Imhoff tanks and sludge beds. Reconstruction and enlargement, when needed, of the two small intermittent sand filters recently built at College Park and Avondale is advised.

For such elements of the project as can be built in units, a total population of 550,000 in 1945 is assumed. Of the outlay for needs up to 1965 interceptors would cost $5,985,000; sewage-works $4,829,400; storm-relief sewers $1,971,500.

Many Applicants for Engineer License in New York State

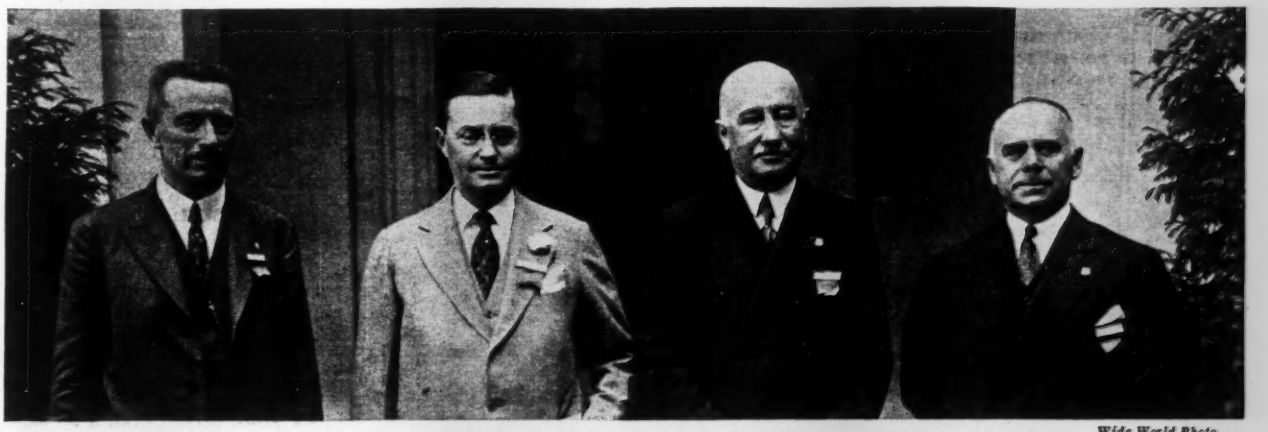
During the year ended June 30, 1930, the state board of licensing for professional engineers and land surveyors in New York State acted upon 1,497 applications for license. Only 843 of these applications were acted upon favorably. Of the remainder, 456 were rejected and 198 held over for more information.

Organized Opposition Develops to Golden Gate Bridge Project

OPPOSITION to the proposed construction of a bridge across the Golden Gate from San Francisco to Marin County has arisen in the form of an organization known as the Taxpayers Committee Against the Golden Gate Bridge Bonds. Among the sixteen members of the central committee which sponsored the official announcement are John D. Galloway, consulting engineer, and M. M. O'Shaughnessy, city engineer of San Francisco.

On the Nov. 4 ballot will appear a measure asking the voters of San Francisco to approve a bond issue for $35,000,000 for the construction of the proposed bridge. The Taxpayers Committee points out that 85 per cent of this amount, or $29,750,000, would be San Francisco's share; "in addition, if operating revenues fail to meet operating costs, interest, bond redemption, insurance, etc., San Francisco must pay 85 per cent of such deficit in its tax rate." The committee also points out that San Francisco has a present bonded indebtedness of $162,500,000; that, aside from the bridge bonds, $6,000,000 of proposed bond issues will be voted on at the November election; and that approval of the bridge bonds will add about 19 per cent to the city's bonded indebtedness.

Other statements in the announcement are: "All figures involving costs,



Wide World Photo.

OFFICERS OF INTERNATIONAL ASSOCIATION OF ROAD CONGRESSES

Herewith are shown the officers of the International Road Congress held last week in Washington, D. C., which was attended by delegates from 60 nations and which was the first meeting of its kind to be held in the United States. From left to right the officers are: Paul LeGavrian, of Paris, secretary-general of the Permanent International Association of Road Congresses; Roy D. Chapin, Detroit, Mich., president-general of the Sixth Congress; Edmond Chaix of Paris, acting president-general of the Permanent International Association of Road Congresses; and Thomas H. MacDonald, Washington, D. C., secretary-general of the Sixth Congress.

maintenance, income, operating and emergency expenses for the proposed bridge are merely theoretical estimates based on future possibilities. Under the proposed method of financing the project, taxpayers of the district, 85 per cent in San Francisco, must, under the law, pay in taxes for any errors, omissions or miscalculations that would cause a deficit. . . . Many phases of the bridge proposition and its financing are subject to grave question. Taxpayers should be given ample opportunity to investigate the financing methods and timeliness of this project before assuming so great an obligation."

The committee maintains that a vote against the bonds at this time will save the taxpayers from shouldering greatly increased bonded indebtedness, a large contingent liability, and will give time for adequate study of this project "with its vast cost and attendant tax obligations."

Under the present plan the proposed toll bridge would be constructed by the Golden Gate Bridge and Highway District, composed of San Francisco, Marin, Sonoma, Mendocino, Napa and Del Norte counties. The main span would be 4,200 ft. long, with a vertical clearance of 220 ft. Joseph B. Strauss is chief engineer for the bridge district.

American Association of Engineers Holds Annual Meeting

The sixteenth annual meeting of the American Association of Engineers was held on Oct. 4 in Chicago. Charles J. Ullrich, consulting engineer, of Salt Lake City, was one of the principal speakers, taking as his subject "The Practicability of Registration of Engineers." Officers were installed as follows: president, James H. Griffin, New York City; vice-president, R. C. Kellogg, of Chicago; secretary, M. E. Melver; treasurer, Henry W. Clausen, of Chicago.

The board of directors of the association held its annual meeting on Oct. 3 and 4. The retiring president, Herman A. Wagner, outlined the activities of the association for the year, declaring that one of the principal reasons for the general lack of recognition given to professional engineers is the overproduction of great numbers of incompetent technicians turned on the market annually by the many fake technical trade and correspondence schools. The board unanimously voted to continue its nation-wide publicity campaign in an earnest effort to teach the youth of the country to "investigate before they invest" when seeking to further a neglected education by way of the correspondence school route. Another reason for the lack of recognition, Mr. Wagner said, is the laxity of the profession in permitting almost anyone to call himself an engineer, because engineers are not required to be registered as are doctors and lawyers. As a consequence, the principle of universal registration of engineers was indorsed by the board.

Announcement was made at the meeting of the completion of an employment survey which is the most thorough of any yet published. The survey will be ready for distribution about Nov. 1, and will show the salaries paid to engineers with various degrees of education and experience. It covers all branches of the profession and will be profusely illustrated with charts and diagrams.

It was announced that the Clausen gold medal, established in 1926, to be given annually to the citizen who makes the greatest contribution to the social and economic welfare of the engineering profession, will be awarded this year to J. A. L. Waddell, bridge engineer, of New York City. The medal will be presented at a dinner meeting to be held in New York early in 1931.

Bond Proposal Defeated by Niagara Falls Voters

At a special tax election on Oct. 7 the citizens of Niagara Falls, N. Y., defeated a proposal to issue bonds to the amount of $706,000 for public improvements. The vote was 887 for and 1,527 against. The projects voted on included building three new fire halls, $155,000; erecting and equipping a central fire and police alarm station, $100,000; building a stadium, swimming pool and playground, $125,000; and the erection of a new municipal hospital, $295,000.

CLAUSEN MEDAL, AWARDED TO J. A. L. WADDELL

Supreme Court Accepts Arizona's Suit Against Boulder Dam

The first stage in Arizona's long-threatened suit to challenge the legality of the act creating Boulder dam was approved by the United States Supreme Court on Oct. 13 when a bill of complaint directed against the six other Colorado basin states and the secretary of the interior was permitted to be filed. The other states and the secretary of the interior will be served with a notice of the bill of complaint and will have until Jan. 5 to file their answers. After the answers have been brought before the court, it then will be determined whether or not an injunction may issue.

While California, Nevada, Utah, New Mexico, Colorado and Wyoming are made defendants in the bill of complaint, it is apparent that the main action is directed against the secretary of the interior. The states were brought in, it is generally believed, to permit the case to go directly before the Supreme Court as a dispute among states. Had the secretary of the interior been proceeded against alone, the case would have had to start in the lower courts.

In its bill of complaint Arizona contends that the project violates its rights and asks that a permanent injunction be issued. It is contended that the project is unconstitutional, and five reasons are given to substantiate this claim. Among other reasons, it is stated that by authorizing the secretary of the interior on behalf of the United States to engage in the business of generating and selling electric power, the project deprives Arizona of its right to collect taxes from other persons or corporations that may desire to use its resources to generate and sell power.

The act authorizing the project requires that the appropriations advanced by the United States be paid back over a period of 50 years and that all additional revenue be turned over to the states of Arizona and Nevada. It is estimated that revenues are assured on the basis of contracts for the sale of power already made that will yield to Arizona more than it could obtain by taxing private power development.

New Name Chosen by Association of Street Sanitation Officials

Meeting Oct. 9-11 at Louisville, Ky., the International Association of Street Sanitation officials approved a change in name to the more comprehensive title of International Association of Public Works Officials. Sponsorship of a committee on uniform street sanitation records, in collaboration with other interested societies, brought out a 50-page tentative report as the outstanding accomplishment of the year. Topics of interest among the dozen on the program included the enforcement of garbage collection ordinances, the handling of dumps, salvaging materials from refuse, snow removal and the advertisement of municipal services.

The measure and control of municipal sanitation, being the report of the committee on uniformity, has long been needed. It was prepared with the co-operation of the International City Managers Association, the Governmental Research Association, the National Municipal League and the American Municipal Association. In the advisory committee are included representatives, among others, of the American Society of Civil Engineers, American Public Health Association and the American Society for Municipal Improvements.

Officers elected for the ensuing year included the following: president, Elmer C. Goodwin, engineer adviser to chairman, Sanitary Commission, New York City; treasurer, P. J. Hurtgen, director of public works, Kenosha, Wis.; secretary, A. M. Anderson, 100 North La Salle St., Chicago, Ill. New York City was chosen as the next meeting place.

A.G.C. to Join International Building Federation

Action Taken at Fall Meeting at Rye, N. Y.—Association to Carry On Under President's Cabinet Form of Government—Prequalification Progress Reported —Ask for Special Contracts on Boulder Canyon Dam Work

AT THE fall meeting of the executive board of the Associated General Contractors of America, held at Rye, N. Y., Oct. 6, 7 and 8, action was taken to join the International Federation of Building and Public Works, a world-wide organization composed of 162,000 contractors. Leo Kauf, of London and Vienna, honorary interpreter of the International Federation, attended the meeting as a representative. Several other important steps were taken at the meeting by the board. As an emergency measure the president's cabinet has been managing the association since the death a year ago of Daniel A. Garber, general manager. This form of government will be continued for at least another year, and in the meantime consideration will be given to the advisability of continuing as at present or of reverting to the general manager rule. The affiliation of a home-builders bureau was discussed and referred to the cabinet for further consideration.

Maintaining that construction of Boulder Canyon dam will require several years for its completion, a period of time during which it will be most difficult to forecast with any degree of accuracy the cost of necessary materials and labor and that the uncertainties in estimating the cost of construction are many, a resolution was adopted that the A.G.C. "request the secretary of the interior to consult with the comptroller-general's office with the object in view of determining and adopting some basis for competitive bidding and a form of contract for said work which will not result in excess cost to the United States nor which will result in either excessive profits or excessive risks [to the contractor], to the end that this great project can be most economically and successfully performed."

Contending that the construction of the Governor's Square Extension subway in Boston, now being built by the city under the day labor system, could be more economically built by qualified contractors selected upon a competitive bidding basis and at a known fixed cost to the city, the board went on record in a resolution that "denounces the flagrant violation of the principles of good government, this encroachment of government into the fields of private business, and urges the taxpayers of Boston to confine their city government to those activities for which it is organized and stop the wasteful expenditure of tax funds."

Home Builders Considered

Recommendations were made at the meeting to devise some means of permitting subcontractors to affiliate with the A.G.C. Another proposed affiliation that received much attention was that of a home builders bureau. Three possible plans were presented: (1) the formation of a resident contractors section of the building division of the A.G.C. with full membership; (2) the formation of an affiliated home builders division of the affiliated bureaus of the A.G.C.; (3) the formation of a national affiliated home builders division of the A.G.C. The second plan would provide membership through separate chapters not affiliated with local chapters, and the third plan would operate by including groups affiliated with local chapters. The matter was referred to the president's cabinet.

Efforts will be made by the A.G.C. to have the United States establish another standard contract form similar to that made uniform in 1927. The 1927 contract form provides for lump sum contracts only, and the association feels that a separate form of contract covering unit price work is desirable. Changes were also recommended for the present lump sum contract form to provide for separate prices for additions and deductions.

Progress of Contract Information

The subject of prequalification and the report of the Bureau of Contract Information received much attention. S. M. Williams, president of the bureau, reported that to Oct. 3 performance records had been received from 3,433 contractors, 1,123 of whom are members of the A.G.C. These records cover 34,190 individual contract projects and the information was compiled from 79,555 replies received by the bureau. Mr. Williams reported on the progress on prequalification throughout the country. Most progress has been made in state highway departments, fourteen states now requiring prequalification on all highway work, two by statute and twelve by insistence of state highway officials. Clarence E. Myers, director of transit, Philadelphia, Pa., spoke on the progress of prequalification in the city of Philadelphia. A prequalification ordinance proposed some time ago was declared unconstitutional, but a new ordinance adopted Sept. 5, 1930, is believed to meet all objections to the previous ordinance.

A resolution was adopted requiring that all new applicants for membership in the A.G.C. shall have their performance records on file with the Contract Information Bureau before they can be admitted to the organization.

Frederick Stuart Greene, superintendent of the New York state department of public works, told of three

Wide World Photo.

NEW HYDRO-ELECTRIC DAM IN BRITTANY

The Union Hydroelectrique Americaine has recently completed construction of this dam at Guerledan in Brittany. The dam is approximately 700 ft. long and 150 ft. high. Electrical power that will be obtained as the result of its construction will supply energy to most of Brittany.

new bridges being planned by the state across the Hudson River. A long cantilever structure to be known as the Rip van Winkle bridge will be built below Hudson, N. Y., and new structures are to be erected at Troy and Albany. Col. Greene told of the state's plan to organize a bridge authority to buy the Bear Mountain bridge and operate it along with the Mid-Hudson bridge, just completed at Poughkeepsie, and to erect and operate the Rip van Winkle bridge, all on a toll basis until all of the structures are paid for. The cost of the three new bridges will total $10,000,000 and work is expected to commence on them within the next year.

Material Price Differentials Condemned

The board condemned the practice of cement companies and other material interests in selling construction materials to public utilities and public bodies at a price below that offered to contractors. It was recommended that this practice, especially in relation to the cement companies, be brought to the attention of the Federal Trade Commission as discriminatory practice.

A charter for a students chapter of the A.G.C. was awarded to North Carolina State College at Raleigh. This chapter will be affiliated with the Carolina branch of the national association.

Although it was not brought up at the general meeting, the subject of contractors estimating fees received much attention at one of the secretary meetings. The Carolinas and the Texas branches of the A.G.C. handle estimating fees on a contract basis, each bidder signing a contract stating that he has added a certain sum to his bid for estimating fees and that if successful in obtaining the work will distribute through the A.G.C. branch a certain sum to unsuccessful bidders as compensation for the cost of preparing bids. Several other chapters and branches are collecting estimating fees. Discussion brought out the fact that in no case has this practice been declared legal or official. In some places the practice of including estimating fees in the bids is discontinued on a project if there is not a 100 per cent participation by all bidders; in other places fees are charged by some contractors regardless of how many are participating.

The board approved the recommendation of the Mixer Manufacturers Bureau that the standard sizes of construction mixers to be manufactured after Dec. 31, 1930, shall be 3½S, 7S, 10S, 14S, 28S, 56S, 84S and 112S. This recommendation eliminates the present standard 5S and 21S machines. It was further recommended that paving mixers be restricted to the 14E and 27E sizes.

Anton E. Horst, Rock Island, Ill., present president of the A.G.C., was nominated for the office for another year. James E. Cashman, Burlington, Vt., was nominated for vice-president at large for another term.

U. S. Government Gets $350,000 Railway Dividend Check

A dividend check for $350,000 has been forwarded to the U. S. secretary of the treasury on the stock of the Panama Railway Co., all of which, amounting to $7,000,000, the government owns. The dividend is declared for the year ended June 30. The Panama Railroad Co. operates the 50-mile railroad across the Isthmus of Panama and a fleet of steamships between Panama and New York. It was constructed in 1850, and was acquired by the United States government in connection with the construction of the Panama Canal.

A.S.T.M. Committee Plans Further Cement Research

At a recent meeting in Washington, committee C-1 on cement of the American Society for Testing Materials effected a reorganization and prepared a preliminary program of work for the coming two years. During the past year the committee submitted to the society a tentative specification for high-early-strength portland cement and an upward revision of the standards for portland cement, both of which have been adopted by the society and are now in effect.

The committee believes that the opportunity is now ripe for rather more fundamental and detailed studies of these two most widely used hydraulic cements, and of the masonry or plastic cements, and such studies have been approved by letter ballot of the society. Investigations of each type of cement and the preparation of a standard has been placed in the hands of a separate subcommittee. There will be a subcommittee on standard portland cement, one on masonry cement, one on all high-early-strength cements, both of the portland and high-alumina type. Another subcommittee will have the duty of preparing the standards for methods of tests.

The committee announces that it would be very glad to have comments as to the types of tests which should be studied.

Wide World Photo.

GERMAN BRIDGE CARRIES FERRY CAR

Part of a large steel railway bridge over the Nord-Ost-See Canal near Rendsburg, Germany, recently erected at a cost of approximately $3,000,000. It has a clearance of 138 ft. above the canal. An interesting feature is the vehicular ferry suspended from the bridge structure.

Survey Proposed of Site for New San Gabriel Dam

Survey of a site 2 miles below the San Gabriel Canyon forks for a 300-ft. rockfill dam with a flexible concrete face, as the first of three dams planned for the canyon to take the place of the abandoned high dam project at the Forks site, has been proposed to the Los Angeles County board of supervisors by E. C. Eaton, chief engineer of the Los Angeles County Flood Control District. He asked for an appropriation of $40,000.

The survey would involve sinking of large test holes in the canyon bed and tunnels on the sides of the proposed location. The work, if authorized by the board, would be done by contract. The expense cannot be borne, under legal opinion, by the unexpended balance of approximately $21,000,000 remaining of the $25,000,000 bond issue voted for the high dam.

City and County Consolidation Proposed in Los Angeles

The Los Angeles city council has inaugurated plans to establish Los Angeles city as a separate county with a consolidated city and county government, similar to that of San Francisco. The council, on recommendation of its finance committee, instructed the city attorney to outline the necessary legal steps for this procedure.

City and county consolidation has been projected several times, but the latest proposal is different in that it leaves the municipalities and unincorporated portions of the county as they are, with the city itself as a county alone. Authority for a separate county must be obtained from the legislature.

Chicago Tests Bridge Paving

To determine the relative wearing properties and economic values of different kinds of paving for city bridges, the south side of the roadway of the Lake St. bridge at Chicago has been paved recently with a variety of materials and various makes of several of these materials. On the north side of the roadway, paved in 1928, there is 2-in. asphalt plank on sub-planking. The test sections, varying in length from 4 ft. to 50 ft., represent the following types, most of which include different makes and different methods of construction or differences in concrete mix:

1. Poured and precast slabs of reinforced concrete made with lightweight aggregate and having 1-in. asphalt finish or 1-in. steel grating embedded in concrete. Concrete 1½ in. thick with expanded metal nailed to treated wood sub-planking or welded to 1-in. steel deck plate. Concrete 2½ in. thick with longitudinal 2½-in. T-bars on 7-in. I-beams.

2. Asphalt planks 2x8 in., 10 ft. long, and 1x12 in., 4 ft. long, nailed to treated sub-planking.

3. Rubber blocks 6x12x1¼ in. and 12x12x2 in., nailed and screwed to treated sub-planking.

4. Treated oak planks 12x3 in., nailed to treated sub-planking. Wood blocks 4x4x8 in., with fir parting strips, on sub-planking. Wood slabs 12 in. wide and 9½ in. deep built up of 2-in. treated oak planks on edge and nailed together, the slabs being bolted to stringers.

These tests are being conducted under the direction of Loran D. Gayton, city engineer, and Paul Schioler, city bridge engineer.

The Business Outlook

The beginning of the fourth quarter shows no quickening in the business tempo other than a moderate expansion of retail trade under the usual stimulus of seasonal influences and low prices. Such expansion is characteristic of poor as well as of good years, and gives no special indication that real recovery this year is under way. Industrial activity lags behind even seasonal expectations, but this disappointment is tempered by the knowledge that the volume of consumption is still fairly well maintained and that shelves are gradually being cleared. A belated seasonal expansion in commercial borrowing and currency circulation and a relative improvement in residential building are brighter spots in the general gloom.

—The Business Week, Oct. 15.

Detroit Awards Another Contract for Welded Water Mains

Supplementing the contract for 13,700 ft. of 54- and 66-in. electrically welded pure iron water pipe noted in *Engineering News-Record*, Sept. 25, p. 511, the city of Detroit, Mich., has awarded to Julius Porath & Son, of that city, a contract for laying 4,700 ft. of electrically welded iron water mains of 36-in. diameter. The pipe will be fabricated in 32-ft. lengths by the Biggs Boiler Works Co., Akron, Ohio, from single plates ½ in. thick, 114¾ in. wide and 383⅜ in. long. It will be shop-tested, preheated and vertically hot dipped.

Chicago Water Certificate Sale Depends Upon Court Decision

Chicago water certificates amounting to $10,997,000 were provisionally sold at a premium of $85,000 on Oct. 7 to a syndicate composed of six banking firms of Chicago and New York. The terms are such that the legality of the issue will have to be approved by the attorneys for the syndicate before the sale can be considered final A test case to establish their validity is now before the state supreme court, whose decision is expected during October.

Connecticut Disputes Master's Report on Water Diversion

By an order of the U. S. Supreme Court issued Oct. 13, the State of Connecticut has been granted an opportunity of stating its objections to the special master's report in its dispute with Massachusetts over the diversion of tributary waters of the Connecticut River. A hearing has been set for Jan. 5. The case had its inception in Connecticut's protest over the action of the metropolitan water supply district of Boston in seeking to divert to its reservoirs waters from the Swift and Ware rivers, tributaries of the Connecticut River.

After deciding that the case properly came under its jurisdiction, the Supreme Court in a previous term appointed Charles W. Bunn as special master to take testimony and make recommendations. The master reported that Connecticut would not be substantially injured by the proposed diversions. Exception is taken to this by the State of Connecticut. It is also contended by attorneys for Connecticut that the federal government can not permit the diversion of boundary waters to another watershed without the consent of all the states concerned.

Louisiana Adopts $100,000,000 Construction Program

As the result of the victory of Governor Long of Louisiana in the senatorial election on Sept. 9, all factions in the state legislature in special session united in voting for his program of public improvements calling for the expenditure within the next four years of more than $100,000,000. Chief among the provisions in the program are:

A toll-free vehicular and rail bridge across the Mississippi River at New Orleans.

A paved highway system, completed with graveled roads linked therewith, at a cost of $68,000,000.

A municipal airport in New Orleans.

A new state capitol at Baton Rouge.

A bond issue for New Orleans permitting the carrying out of a large construction program.

The legislation is nearly all in the form of constitutional amendments which will be submitted to the voters on Nov. 4, but it is expected that all will be adopted.

Relining Begun of 125-Mile Los Angeles Water Tunnel

First work on the $600,000 repair project of the Los Angeles water bureau was begun the first week in October with the commencement of relining of about 125 miles of the Owens River aqueduct tunnel to augment delivery of water to the city. The work is being carried on under the $38,800,000 water bonds voted last May.

Refinishing and smoothing off the floor and walls of the tunnel is expected

to increase the speed of the water flow sufficiently for the delivery of 27,000,000 gal. additional per day to the city's local reservoirs. The interior of the tunnel, the bore of which is about 10 ft. high and 12 ft. wide, is of rough finish cement and has been deeply scarred and scoured by the flow of water for seventeen years.

Brief News

CONTRACTS for the new state building in Los Angeles have been let by the state department of public works. The total amount of the awards is $1,085,260.

BONDS for $2,500,000 have been voted for the construction of a dam on Pecan Bayou, about 9 miles north of Brownwood, Tex., for the purpose of impounding water for irrigation and municipal purposes. The contract will be awarded early in November.

AERIAL PHOTOGRAPHS of the Mississippi River region will be taken for use by government engineers in connection with problems involved in flood-control work. The area to be covered will comprise about 9,000 square miles, embracing large portions of Kentucky, Tennessee, Arkansas and Mississippi. About 14,000 pictures will be taken, to be fitted into large line maps and topographic maps.

IN THE ANNUAL REPORT of the highway department of the District of Columbia the suggestion is made that a clause be inserted in contracts for paving work in the congested section requiring a double shift of workers to minimize delays to traffic. The report, which was submitted by Capt. Herbert C. Whitehurst, district highway engineer, records the expenditure of $4,093,049 during the past fiscal year.

BIDS FOR THE CONSTRUCTION of the 7-mile government railroad from Boulder City, Nev., to the site of Boulder dam will be asked shortly from the Denver office of the U. S. Bureau of Reclamation. The railroad and a highway down the Colorado River will be under construction by Nov. 1, and a water-works for Boulder City will be started Jan. 1, 1931. The water supply will come from artesian wells near Las Vegas.

WIDENING OF ALL MAIN ROADS in New York State by 1940 to widths of more than 40 ft. is planned by the state department of public works, which has adopted an ultimate road-width map based upon a traffic survey made last August. The width of roads on the map was determined by a census of the number of cars traveling over them during a twelve-hour daylight period. Frederick Stuart Greene, state superintendent of public works, states that he feels confident the legislature will appropriate sufficient funds to carry out the plan in the next ten years.

Personal Notes

L. H. MALE, for the past five years chief sanitary engineer of the Utah state board of health, has resigned and has been succeeded by O. C. PICKEL, formerly sanitary engineer to the Argentine government.

BENO GUTENBERG, German seismologist, has taken up his joint duties at the California Institute of Technology and Carnegie Institute's seismological laboratory at Pasadena, Calif. Dr. Gutenberg was formerly connected with the University of Frankfort.

JOHN F. SULLIVAN, consulting engineer for the New York City board of estimate and apportionment, attached to the mayor's office for city planning purposes, has been made commissioner of city planning, an office recently created, with a salary of $17,500.

FREDERICK H. WEED, of Harrisburg, Pa., and R. W. STONE, assistant state geologist of Pennsylvania, sailed from New York on Oct. 11 for Colombia, where they will be engaged in engineering and geologic work for about six weeks, particularly in the vicinity of Bogota.

WILLIAM E. SARVER, for twenty years city engineer of Canton, Ohio, has resigned to accept an appointment as consulting engineer in the development of a sewer extension program which the city is soon to undertake. Mr. Sarver will be succeeded as city engineer by JOHN A. SHISLER, construction engineer in his office, and Mr. Shisler in turn will be succeeded by LLOYD W. LUTZ, who has been assistant construction engineer.

HERBERT J. WILD, major, Corps of Engineers, in charge of the second Chicago district, has been assigned to duty in Hawaii. He will be relieved next February by Lieut.-Col. W. GOFF CAPLES, who is at present completing a term of service in Panama. The second Chicago district extends along the shore of Lake Michigan from the Wisconsin line to New Buffalo, Mich.

FRANK TAYLOR CHAMBERS, rear admiral, Civil Engineer Corps, U. S. Navy, who has been on duty as public works officer, Third Naval District, New York City, has been appointed to succeed the late Rear Admiral Harry H. Rousseau, Civil Engineer Corps, as director of naval petroleum reserves and oil shale reserves. He will have additional duty as the navy representative on the technical and advisory committee of the Federal Oil Conservation Board.

Society Calendar

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Washington, D. C.; annual meeting, Pittsburgh, Pa., Nov. 17-20.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, New York City; Pinehurst, N. C., Oct. 27-28.

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York; annual meeting, Fort Worth, Tex., Oct. 27-30.

ASPHALT PAVING CONFERENCE, New York City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

AMERICAN ROAD BUILDERS' ASSOCIATION has sent out the list of official nominees for officers for 1931-32 as submitted by the nominating committee. Other nominations may be made by petition before Nov. 3. The official nominees are: president, William R. Smith, Meriden, Conn.; vice-presidents, Samuel Eckels, Harrisburg, Pa., H. G. Shirley, Richmond, Va., S. F. Beatty, Chicago, Ill., Samuel Hill, Seattle, Wash.; treasurer, James H. MacDonald, New Haven, Conn.

CENTRAL STATES SECTION, American Water Works Association, held its 32d annual convention on Sept. 25 and 26 in Youngstown, Ohio. Outstanding on the program were open forums on practical questions of water-works operation and maintenance and on practical questions of water purification. Officers were elected as follows: chairman, W. H. Dittoe, Youngstown, Ohio; vice-chairman, A. H. Hibbs, Cincinnati, Ohio; secretary-treasurer, B. J. Lechner, Erie, Pa.

LEAGUE OF VIRGINIA MUNICIPALITIES will hold its 25th annual convention in Roanoke on Oct. 22 and 23. It is planned to make this the greatest convention of municipal officials ever held in the State of Virginia.

NATIONAL READY MIXED CONCRETE ASSOCIATION will hold its next convention in St. Louis on Jan. 26, 1931. J. C. Eakin, Little Rock, Ark., is secretary.

Obituary

MORTIMER G. BARNES, former chief engineer of the Illinois division of waterways, died on Oct. 7 at his home in Oak Park, Ill., after a long illness. Mr. Barnes was born in Reedsburg, Wis., in 1867. He had been engaged on many waterway projects, including the St. Mary's Falls canal, the Birmingham ship canal, the Illinois and Michigan canal and the New York barge canal. He was made chief engineer of Illinois waterways in 1917, and resigned in 1928 because of ill health, but was retained as consulting engineer.

RICHARD MEADE, of Roland Park, Md., who during his lifetime was a prominent figure in the cement industry, died on Oct. 13 at the age of 55. At one times Mr. Meade was general manager of the Tidewater Portland Cement Co., but since 1912 he had been in consulting practice in Baltimore.

N. B. BOGUSLAVSKI, professor of structural engineering at the Institute of Ways of Communication at Leningrad, Russia, died in that city on Oct. 8 at the age of 71. Professor Boguslavski was one of the best-known Russian bridge engineers. During his long activity he took part both in the practical and in the theoretical side of bridge engineering and many Russian railroad bridges were designed by him. Practically all the designs of Russian large bridge structures during the last 30 years passed through his hands. For many years he occupied the position of chief of the technical department of railroad direction. After the revolution Professor Boguslavski was made a member of the Supreme Technical Council.

Construction Equipment and Materials

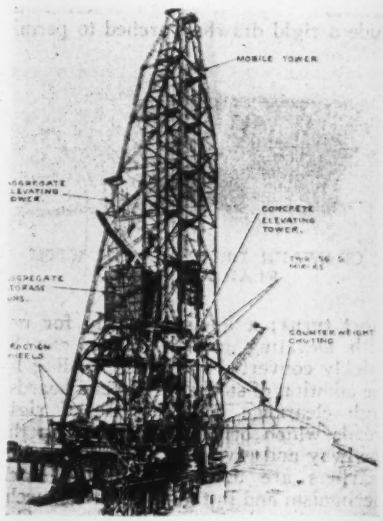
Plant Uses New Process for Production of Wrought Iron

Formal opening of the new plant of the A. M. Byers Co. near Ambridge, Pa., for the large-scale production of wrought iron took place Oct. 8. The plant, which has a present capacity of approximately 50,000 tons of metal per month, is situated on a tract of 126 acres on the Ohio River about 20 miles below Pittsburgh. It is the first large-scale plant to be built for the production of wrought iron by the Byers process, which is analogous in principle to the hand-puddling process, but achieves the same objectives in a different manner, substituting machinery for hand labor. Pure iron, obtained by melting pig iron in a cupola and then refining the molten metal in a bessemer converter, is poured into a bath of slag prepared in an open-hearth furnace. As the molten iron falls through the liquid slag it solidifies into a granular form and gathers in the form of a ball in the bottom of the cup. After the slag has been decanted from the cup, the ball, weighing from 6,000 to 8,000 lb., is formed into a bloom, or ingot, in a 900-ton press which also squeezes out the surplus slag. Reduction of the bloom to finished products is in accordance with standard rolling-mill practice.

Two 1,800-Ton Portable Plants Supply Concrete for Indian Dam

In the construction of the Metur Cauvery dam, in India, requiring more than 2,000,000 cu.yd. of concrete, two huge portable plants for mixing and distributing concrete are being used which differ radically from the conventional mixer-and-tower placing equipment. In planning the work it was realized that the tremendous amount of floodwater which comes down during the rainy season, bringing with it a large amount of debris, would make it practically impossible to use fixed towers. Concrete plants of the portable type, which could be moved out of the way during high water, were the only solution. In order to make the structures completely portable and to eliminate guy lines, the contractors decided to have the mixers mounted on the towers, which, in turn, made it necessary to include elevators and storage hoppers for the aggregates and other material.

To meet these requirements two plants, each of which weighs approximately 1,800 tons, were designed and manufactured especially for the job by Stotherd & Pitt, Ltd., of Bath, England. Each plant consists of a large portable mixing and chuting installation more than 300 ft. high, with which is incorporated all the required hopper-loading apparatus, a 500-ton aggregate storage hopper, batch-measuring hoppers, two T. L. Smith 56-S mixers, and distributing chutes. All of this equipment, with the supporting framework, travels along the forms on two tracks, the weight being carried by 32 wheels on the front rail and 16 on the rear. As the track upon which the tower moves has both level and inclined portions, an adjusting device is provided



ONE OF TWO 1,800-TON MOVABLE TOWERS USED FOR MIXING AND PLACING CONCRETE ON METUR CAUVERY DAM, INDIA

which keeps the tower vertical regardless of the track inclination. Two traversers transfer dump cars from tracks on the dam to hinged ramp girders slung from the machine, which carry them to the dumping points and back again to the return rail on the dam. The cars are pulled up and lowered down the ramp girders by means of a central capstan. Aggregates used include 10-in. plums, 2½- and 1¼-in. stone, and sand; approximately 2.8 tons is used for each batch. With two plants, each containing two 56-S mixers, the total output of concrete per twelve-hour day is 4,000 tons.

Prizes Offered for Elevated Steel Tank Designs

In order to develop further the natural architectural possibilities which it believes inherent in elevated steel tanks, the Chicago Bridge & Iron Works, Chicago, Ill. is sponsoring a competition, open to any architect, engineer or draftsman, for the design of a typical tank and tower. Eight prizes ranging from $2,000 to $100 are offered. These will be awarded by a jury consisting of Howard Cheney, president, Chicago chapter, American Institute of Architects; R. W. Zimmerman, architect, Chicago; and George T. Horton, of the Chicago Bridge & Iron Works. In order to participate in the competition, it is necessary to make formal application to the professional adviser, Albert M. Saxe, 430 North Michigan Ave., Chicago, Ill., on or before Dec. 1, 1930.

Concrete Pavement Yardage

Appended below is a tabulation of concrete pavement yardage awarded during the month of September, 1930, and also the total number of square yards awarded for roads, streets and alleys in the United States for the year 1930 to date as of Sept. 27:

	Sq.Yd. Awarded During Sept. 1930	Sq.Yd. Awarded From Jan. 1, 1930 to Sept. 27, 1930
Roads	6,359,756	91,314,083
Streets	3,525,190	27,680,024
Alleys	195,474	1,979,615
Totals ...	10,080,420	120,973,722

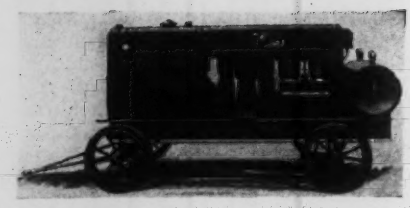
New Developments

Automatic Spring Wind-Up for Crawler Wagons

Mechanical closing of the dumping doors on crawler wagons manufactured by the Austin-Western Road Machinery Co., Chicago, Ill., is made possible by a new device consisting of a strong spring inclosed in a cylindrically shaped housing which is mounted on the rear of the main supporting frame of the unit. This mechanism is controlled by the tractor driver by means of a rope connection to the operating arm. If desirable, the dump boss can handle a load by pulling the same cord. In operation, one pull releases the doors and dumps the load, while a second, after the unit has cleared the dumped material, closes the doors by means of the spring mechanism. The device was illustrated in *Engineering News-Record*, Sept. 18, 1930, p. 475.

Air-Cooled Compressor Mounted on Skids or Wheels

Air-cooling is applied in air compressor construction for the first time on a commercial scale in a series of models produced by the Davey Compressor Co., Inc., Kent, Ohio. The compressor unit, which delivers 142 cu.ft. of air per minute, is of the two-cylinder vertical type, with a bore and stroke of 6 in. It can be obtained for direct mounting on Caterpillar or McCormick-Deering tractors, or mounted as a self-contained unit on skids or wheel trailers. Power for the tractor mountings, described in *Engineering News-Record*, March 13, 1930, p. 464, is derived from the power take-off. For separate mounting, a Hercules 34-hp. motor is furnished, with

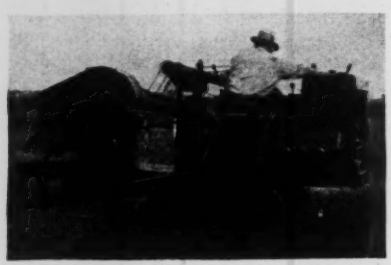


COMPRESSOR UNIT ON TRAILER

transmission through two sets of V-type multiple belts and a disk clutch. Due to the mechanical simplicity of the air-cooled construction, the Davey compressor weighs, on the average, nearly 1,000 lb. less than water-cooled compressors of corresponding capacity and type. A special aluminum alloy which is a very rapid conductor of heat is used in casting the compressor head and manifold, which are provided with deep fins to give greater radiating area.

Small Vertical-Boom Ditcher for Light Trenching

A vertical-boom ditcher only 4 ft. wide and 11½ ft. long that will dig a trench from 5 to 8 in. wide and up to 3 ft. deep at speeds varying from 15 in. to 12 ft. a minute is the latest achievement of the Barber-Greene Co., Aurora, Ill. The new machine—the Service Special ditcher—has all of the features of the big Barber-Greenes. It is crawler mounted. It has the vertical boom which allows it to dig right up to a sidewalk or curb, ending the trench flush, and to cut a square corner. As an insurance against strains caused by striking underground obstacles and as a protection to any underground pipes, the machine is equipped with the standard B-G overload release sprocket, a device that automatically stops the bucket line without injuring anything or killing the engine. The construction of this sprocket is such that at every half revolution it exerts a pull on the bucket line before slipping again, and if the operator desires he can keep the buckets pounding at the obstacle until it is cut through.



UTILITY DITCHER IN ACTION

The buckets clean themselves automatically, even in very sticky material. Attached to the boom is a telescoping follow-up scraper which insures a clean trench. The boom is raised by power, making it possible for the operator to dig accurately to grade at all times. A four-cylinder Buda gasoline engine developing 33 b.hp. supplies the power. Traveling speeds of the Service Special are 2 and 1½ m.p.h. Its speed, small size and crawler mounting make it highly maneuverable and to do things that would be impossible with any big ditcher. It is essentially a "Service Special," doing a most efficient job of cutting conduit, service and lateral trenches.

Crawler Dump Wagon Mounted on Rigid Treads

Designed especially to withstand the wear and tear to which the modern earth-moving unit is subjected, the new 7-8 cu.yd. Dreadnought crawler dump wagon announced by the crawler wheel division of the Electric Wheel Co., Quincy, Ill., is of unusually sturdy construction. Special design features include a rigid drawbar, arched to permit short turns; a low-sided body for use with elevating graders which can be quickly converted for shovel loading by the addition of steel side and end boards; high clearance, and the use of rigid treads which bridge depressions in the roadway and give easy traction. Roller bearings are used both in the track mechanism and in the door-lifting mechanism, which is of the manual type. Optional equipment includes a mechanical wind-up and a special heavy-duty drawbar for use with the Caterpillar 60 tractor. The wagon has a total weight of approximately 14,000 lb. with side boards.

CRAWLER DUMP WAGON WITH FLARE BOARDS

E. N.-R. Index Numbers

	Cost			Volume	
Oct.	1, 1930	198.72	Sept.,	1930	232
Sept.	1, 1930	199.58	August,	1930	259
Oct.	1, 1929	206.32	Sept.,	1929	340
Average,	1929	207.02	Average,	1929	317
Average,	1928	206.78	Average,	1928	287
1913	.....	100.00	1913	.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Oct. 16, with some comparisons, total as follows:

(In Thousands of Dollars)

	Oct. 16, 1930	Average of Last Four Weeks 1930	1929
Buildings:			
Industrial	$1,367	$4,763	$5,149
Other	18,467	21,822	43,297
Streets and roads.	5,332	9,997	11,639
Other eng. constr.	4,855	9,224	11,238
Total	$30,021	$45,808	$71,324

Total, all classes Jan. 1 to Oct. 16:
1930 ..... $2,707,059
1929 3,398,559

Business Notes

PACIFIC ELECTRIC MFG. CORP., San Francisco, Calif., has opened a branch office at 89 Broad St., Boston, Mass. This will be in charge of G. A. Wright, who has had wide experience in the field of electrical transmission and distribution equipment.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., has appointed L. B. Mead assistant industrial manager of the Northwest district. William J. Morgan will succeed Mr. Mead as Indianapolis manager.

OWEN BUCKET CO., Cleveland, Ohio, has opened a branch office and warehouse at 36-25 Twenty-second St., Long Island City, N. Y., in charge of Frank W. S. Elmes.

PATENTS HOLDING CORP., Frederick, Md., has granted a license to the Caterpillar Tractor Co., Minneapolis, Minn., to manufacture power-propelled road graders and maintainers under patents controlled by Patents Holding Corp.

PENNSYLVANIA-DIXIE CEMENT CORP., New York City, announces the following changes in personnel in its Boston office: H. E. Bernt becomes district sales manager, succeeding E. G. Brick, who will remain with the corporation, his future duties giving him more frequent contact with the trade. R. M. Penman becomes assistant district sales manager at Boston.

New Publications

Waterproofing—"How to Make Good Waterproofed Concrete" is the title of a 28-p. illustrated bulletin issued by the MEDUSA PORTLAND CEMENT CO., Cleveland, Ohio.

Concrete—Commercial concrete plants are considered in two recent publications of the BUTLER BIN CO., Waukesha, Wis. Bulletin 180 illustrates and describes loading plants for use with truck-mounted mixers, while bulletin 190 gives similar information with regard to ready-mixed concrete plants where a stationary mixer is used.

Shore Protection—PORTLAND CEMENT ASSOCIATION, 33 West Grand Ave., Chicago, Ill., has issued a 32-p. bulletin discussing shore protection by means of concrete structures of a number of interesting designs.

Protective Coatings—Two bulletins issued by the HEADLEY EMULSIFIED PRODUCTS CO., Philadelphia, Pa., deal with waterproofing, damp-proofing and general protective coatings (bulletin 330) and describe an asphalt base aluminum coating (bulletin 430).

Bentonite—Properties, sources, geology and production of bentonite are discussed in a 22-p. illustrated bulletin 107 of the SILICA PRODUCTS CO., Kansas City, Mo.

Crawler Treads—TRACKSON CO., Milwaukee, Wis., has issued a circular describing the model F Trackson crawler for use with the new Fordson tractor.

Wood Construction—"Stronger Frame Walls," a publication of the NATIONAL LUMBER MANUFACTURERS ASSOCIATION, Washington, D. C., contains an abstract of the full report of the Forest Products Laboratory concerning tests on various forms of rigid frame wall construction.

Excavating Equipment—BAY CITY SHOVELS, INC., Bay City, Mich., has issued new catalogs dealing with ¾-cu.yd. full-revolving power shovels, tractor shovels and the Cranemobile.

Motor Graders—A new motor grader catalog has been issued by the AUSTIN-WESTERN ROAD MACHINERY CO., Chicago, Ill., covering in detail the latest developments in Austin single and dual drive power graders.

Dividing Machines—Linear and circular dividing machines for laboratory and industrial uses are described in a 36-p. illustrated catalog 508 issued by the Societe Genevoise d'Instruments de Physique, of Geneva, Switzerland, represented in the United States by the R. Y. FERNER CO., Washington, D. C.

Motor Trucks—"The Motor Truck as an Engineering Job," an article by Harry W. Miller which appeared in the *Australian Motorist*, has been reprinted by the International Harvester Co., Chicago, Ill. This company has also issued a 32-p. illustrated bulletin showing trucks at work on engineering jobs under widely varying conditions.

Unit Prices From Current Construction Bids

New Jersey State Road, Route 4, Sec. 3

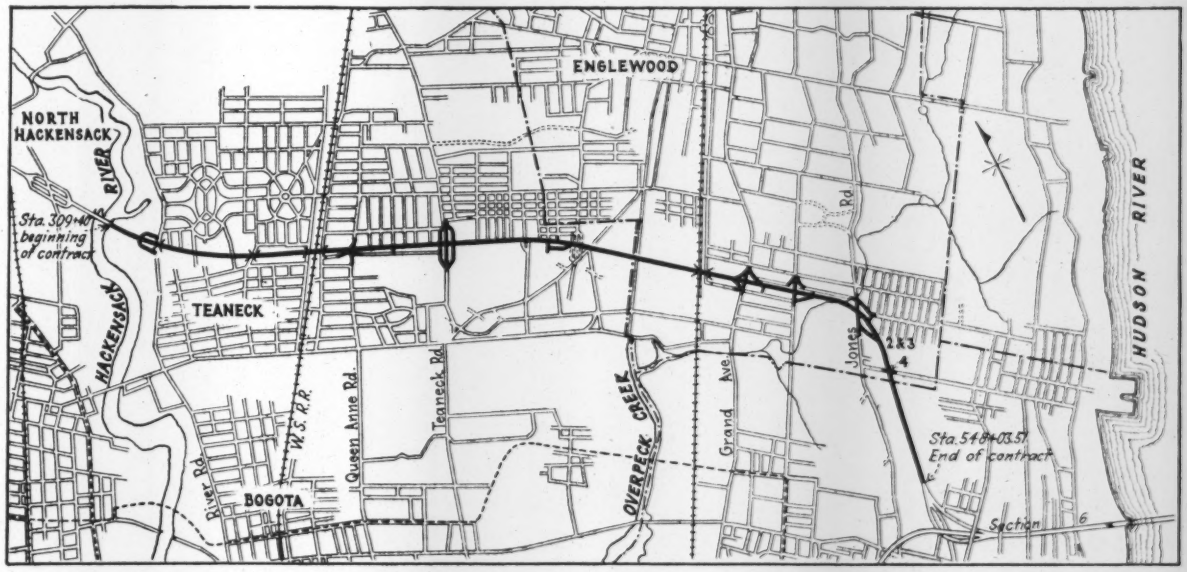
CONTRACT for Route 4, Sec. 3, a New Jersey state highway extending from the Hackensack River to Fort Lee in Bergen County, to consist of 22,510 lin.ft. of concrete and bituminous pavement and four stream bridges totaling 1,278 ft., was awarded in September, 1930, to the Consolidated Production Co., 162 Beach St., Hackensack, for $1,647,734. Sec. 3 connects with Sec. 4 at the west end and Sec. 6 to the new Hudson River bridge at the east. Location and typical sections are shown. The first part to be completed is that between Grand Ave. and the east end. Ramps and underpass roadways for diverting traffic will be constructed at Grand Ave., and at Teaneck, River, Queen Anne and Jones Roads. Ramps will be paved with either concrete or oil-treated cinders. The cost of maintaining traffic is included in item 7 for 10-in. reinforced-concrete pavement.

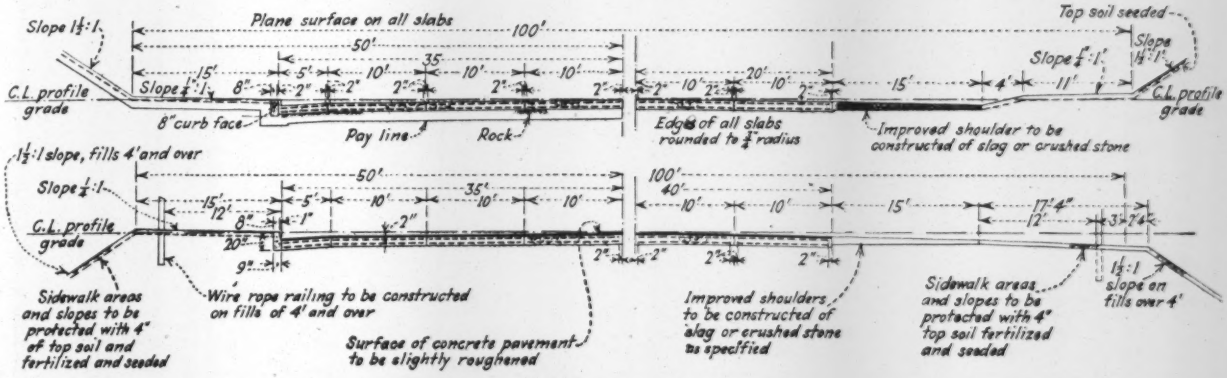
Work is to be completed in 180 working days, and during this period twelve bridges will be constructed under other contracts, the road contractor providing access to the sites.

The first operation is stripping top soil, wet excavation, and forming embankments of 8 ft. or more. After plowing the ground soil and rolling it, the fill material is placed in 6-in. layers and compacted with tractors. Every 3-ft. height is rolled lengthwise and across by 10-ton rollers. Pipes or culverts are not placed in fills until the embankment has been carried 3 ft. higher than the proposed top of the pipe, when the embankment is compacted and trenched and the pipe laid and backfilled. The heavy fills over the meadows will be paved after all the other paving has been done.

Earth excavation, which excludes rock, wet and ditch, includes removal of pipe, fences, hedges, curbs, sidewalks, and structures except buildings, and forming embankments and disposal of material. Item 60 covers removal of the existing pavement. Payment line for rock is 12 in. below pavement, and removal must be to 6 in.

The 10-in. reinforced concrete is placed and struck off in three layers; the 8-in. in two layers; expansion joints spaced 34½ ft. Reinforcing for 10-in. consists of a double layer of ⅜-in. deformed bars or rods or wire fabric; for 8-in., one line. Trolley-track pavement is 14½ in. plain.




Slope 1½:1
Plane surface on all slabs
100'
50'
Top soil seeded
Slope ¼:1
Slope ¼:1
C.L. profile grade
8" curb face
Pay line
Rock
Edges of all slabs rounded to ¼" radius
Improved shoulder to be constructed of slag or crushed stone
C.L. profile grade
1½:1 slope, fills 4' and over
Slope ¼:1
C.L. profile grade
Sidewalk areas and slopes to be protected with 4" of top soil and fertilized and seeded
Wire rope railing to be constructed on fills of 4' and over
Surface of concrete pavement to be slightly roughened
Improved shoulders to be constructed of slag or crushed stone as specified
Sidewalk areas and slopes to be protected with 4" top soil fertilized and seeded
1½:1 slope on fills over 4'

LAYOUT OF ROUTE 4, SEC. 3, OF NEW JERSEY STATE HIGHWAY FROM HACKENSACK RIVER TO FORT LEE, AND TYPICAL CROSS-SECTIONS

Upper—Roadway grading, drainage, and construction of 22,510 ft. reinforced-concrete and bituminous concrete. Earth excavation totals 441,148 cu.yd., of which 376,937 is available for embankment work totaling 1,134,025 cu.yd. Rock totals 82,322 cu.yd., all suitable for embankment; borrow, 757,088 cu.yd. These items total 44 per cent of contract price. Principal paving item, 181,912 sq.yd. 10-in. reinforced concrete amounts to 33 per cent of price.

Lower—Half-sections respectively of 55-ft. and 40-ft. concrete 10 in. thick and of 70-ft. and 40-ft. fine aggregate bituminous-concrete surface on 10-in. reinforced concrete.

1.	441,148 cu.yd. earth excav.	$ 0.57	$251,454
2.	13,831 cu.yd. wet excav.	.50	6,915
3.	82,322 cu.yd. rock excav.	.57	46,924
4.	757,088 cu.yd. borrow	.57	431,540
5.	2,630 cu.yd. earth ditch	.50	1,315
6.	500 culvd. sub-base	1.00	500
7.	181,912 sq.yd. surface type C rein.-conc. pav., 10-in. uniform thickness (surface mixture A) with double line rein.	3.00	545,736
8.	6,966 sq.yd. surface type C rein.-conc. pave., 8-in. uniform thickness with single line rein.	2.50	17,415
9.	1,794 sq.yd. trolley track pave. of plain conc. 14½ in. thick	4.00	7,176
10.	24,089 sq.yd. bit. conc., type FA-BC-1, or type A 2 in.	.90	21,680
11.	3,275 sq.yd. plain conc. foundation 6-in.	1.50	4,913
12.	278 sq.yd. bituminous penetration macadam, compacted plain macadam foundation and 3-in. compacted bit. penetration mac. surface	1.60	445
13.	288 sq.yd. plain conc. surface in aprons and drives	2.00	576
14.	957 cu.yd. improved surface in intersecting roads	2.00	1,914
15.	43,068 sq.yd. improved shoulders	.25	10,767
16.	198,078 sq.yd. preparation sub-grade	.10	19,808
17.	13,167 lin.ft. plain conc. curb 9x20 in., incl. earth excav., refilling	.70	9,217
18.	22,476 lin.ft. white conc. curb 9x20 in., using white cement and white shiny sand	.90	20,228
19.	15,274 lin.ft. white curb, 12x15 in.	.90	13,747
20.	1,471 lin.ft. white curb, 12x11 in.	.90	1,324
21.	876 lin.ft. conc. header	.70	613
22.	4,668 sq.yd. black conc. sidewalk, 6 in. thick	2.25	10,503
23.	2,336 sq.yd. plain conc. sidewalk, 4 in.	2.00	4,672
24.	172.7 cu.yd. class D conc. in headwalls	18.00	3,109
25.	55.7 cu.yd. class C conc. in steps and open inlet boxes	15.00	836
26.	401 lin.ft. rein.-conc. box culvert, 4 ft. 11½ in.x3ft. 4 in.	8.00	3,208
27.	Two trolley track inlets	100.00	200
28.	529 lin.ft. 8-in. vitr. clay pipe for sanitary sewer	1.25	661
29.	586 lin.ft. 10-in. vitr. clay pipe	1.40	820
30.	1,155 lin.ft. 12-in. vitr. clay pipe	1.50	1,733
31.	283 lin.ft. 12-in. c.-i. pipe	3.00	849
32.	127 lin.ft. 18-in. c-i. pipe	3.50	445
33.	207 lin.ft. 24-in. c.-i. pipe	6.00	1,242
34.	32 lin.ft. 42-in. c.-i. pipe	13.00	416
35.	9,472 lin.ft. 18-in. rein.-conc. or d.s. vitr. clay pipe	1.50	14,208
36.	250 lin.ft. 18-in. d.s. vitr. clay pipe	1.50	375
37.	169 lin.ft. 21-in. rein.-conc. or d.s. vitr. clay pipe	2.00	338
38.	5,593 lin.ft. 24-in. rein.-conc. or d.s. vitr. clay pipe	2.25	12,584
39.	529 lin.ft. 30-in. rein.-conc. or d.s. vitr. clay pipe	6.00	3,174
40.	3,863 lin.ft. 36-in. rein.-conc. or d.s. vitr. clay pipe	7.00	27,041
41 to 44.	142 drop inlets	70.00	9,940
50.	1,379 sq.yd. grouted riprap	.10	138
51.	24,015 lin.ft. wire rope rail in place, incl. excav., refill, conc. for posts, painting	.70	16,811
52.	26.4 acres clearing and grubbing	100.00	2,640
53.	214,549 sq.yd. top-soiling 4 in. deep	.01	2,145
54.	41,324 sq.yd. top-soiling 8 in.	.05	2,066
55.	255,873 sq.yd. fertilizing and seeding	.01	2,559
56.	1,738 sq.yd. asphalt painted surface	.20	348
57.	8,633 lin.ft. 2-in. genuine w.-i. pipe for electrical conduit	.40	3,453
58.	1,044 lin.ft. 2-in. genuine w.-i. pipe (water lines)	.60	626
59.	2,245 lin.ft. 1-in. genuine w.-i. pipe (water lines)	.30	647
60.	11,025 sq.yd. removal conc. pave. incl. foundation with bit. conc. surface	.25	2,756
61.	830 sq.yd. 7-in. plain mac. pave. (waterbound) of 4-in. plain mac. found. and 3-in. waterbound mac. surface	1.25	1,048
62.	500 cu.yd. earth excav. in trenches due to lowering grades of drains	1.00	500
63.	5,000 lb. rein. steel	.04	200
64.	3,843 sq.yd. 18-in. rein.-conc. bridge approach slabs	4.00	15,372
65.	6,500 sq.yd. 6-in. oil-treated cinder surface	.40	2,600
66.	8,000 sq.yd. 3-in. bit. mac. surface and 6-in. mac. found	1.75	14,000
67.	1,812 lin.ft. trolley track reconstruct	1.50	2,718
68.	650 lin.ft. temporary relaid single trolley track	5.00	3,250
69.	500 sq.yd. sodding	.30	150
	BRIDGE ITEMS		
70.	2,116 cu.yd. uncl. excav. for abutments	5.00	10,580
71.	146 lin.ft. balustrades of class A conc.	5.50	803
72.	666 cu.yd. class B conc. for bridge structure	24.00	15,984
73.	952 cu.yd. class C conc.	13.50	12,852
74.	265 cu.yd. class D conc. for footings of abut.	12.00	3,180
75.	99,370 lb. rein. steel, dowels and bolts in place	.04	3,975
76.	104,100 lb. struct. steel erected	.035	3,644
77.	90 lin.ft. black iron form and bit. mastic for gutter lines, in place	.70	63
78.	620 lin.ft. standard metal caging for incasing beam flanges	.10	62
79.	9,480 lin.ft. timber piles, furnished, driven and cut off	.70	6,636
80.	133 cu.yd. channel excav.	1.00	133
83.	For bridge over drainage canal (lump sum)	....	400
84.	For bridge over brook west of Jones Road (lump sum)	....	300
85.	For culvert over brook (lump sum)	....	200
86.	For the culvert under Myrtle Ave. (lump sum)	....	200
	Total		$1,647,734

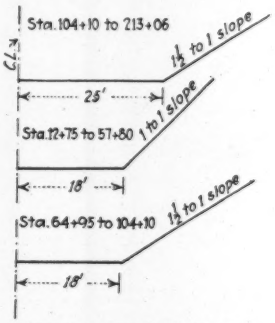
Item 65 covers temporary roads constructed with hard steam cinders rolled to a depth of 6 in. and treated with dust oil (0.4 gal. per square yard).

Four bridge structures will be built under this contract. The most westerly, over the drainage canal at sta. 442 + 35, has a span 40 ft. in the clear, and a 40-ft. roadway with 12-ft. sidewalks on each side. Superstructure is of longitudinal steel beams incased in concrete, with a concrete deck paved with bituminous macadam. Substructure consists of concrete abutments with wing walls on wood piles. The footing courses are connected by struts of reinforced concrete constructed below canal bed and founded on piles. The second bridge, over a brook west of Jones Road, has a 20-ft. span and is of reinforced concrete, with abutments and wing walls of U-form and founded on the soil. The other two structures are 6x6-ft. concrete box culverts.

Contract prices are given in the accompanying tabulation. C. A. Burn, division construction engineer of the state highway commission, supervises the road work; Morris Goodkind, bridge engineer, supervises the bridge work.

Open Drainage Near Akron

WOLF CREEK drainage project in Summit County, Ohio, the Akron district, totals 21.81 miles of open ditch. The work is divided into thirteen sections, and Sec. 32, of 3.84 miles, was awarded July 14, 1930, in two proposals: (1) dredging 551,000 cu.yd., repairing bridges, constructing dike, sump and pump house, $140,516 contract price; (2) constructing storm sewers, lowering sewers and water lines, $20,303 contract price. Typical sections are shown herewith. Following are the total bids on the two proposals:



TYPICAL SECTIONS OF WOLF CREEK OPEN DRAINAGE

	1	Per Cent From Average	2	Per Cent From Average
Low	$140,516	6	$20,303	8
2nd	144,775	3	20,932	5
3d	146,916	1½	21,098	4
4th	148,403	¼	21,657	1½
5th	149,408	¼	22,346	1
6th	153,890	3	22,835	4
7th	159,839	7	24,947	13
Average	$149,000		$22,000	

Unit prices are given of the lowest three bidders on proposal 1: A, (contract) Frank George, 1657 Mahoning Ave., Youngstown; B, Fred C. Morgan, and C, W. J. Stroman.

	A	B	C
350,000 cu.yd. excav. ditches over 20 ft. bottom	$0.09	$0.11	$0.11
201,000 cu.yd. excav. ditches 20 ft. bottom and less	.10	.11	.11
11,000 cu.yd. waste to be hauled and spoiled	.20	.25	.35
13,000 cu.yd. earthfill in place, dike	.50	.25	.35
13,000 sq.ft. steel sheeting in place, dike	1.30	1.15	.75
1,200 lin.ft. creosoted hardwood piling, furnished	.70	.80	1.00
1,200 lin.ft. creosoted hardwood piling, driven	.60	.50	.50
14.4 M.b.ft. creosoted pine plank in place	75.00	90.00	90.00
1,200 sq.yd. riprap on slope of dike	.75	.80	.50
60 anchors complete	5.00	7.00	7.00
2,050 cu.yd. excav., around and under bridge abutments	2.00	2.25	2.50
7,000 sq.ft. steel sheeting in place, bridges	.60	.85	.95
4,600 sq.ft. 4- to 6-in. creosoted hardwood sheeting in place	.70	.80	.70
8,000 lb. steel I-beams in place, bridges	.05	.05	.05
100 lb. reinforcing steel in place, bridges	.05	.05	.05
30 M.b.ft. oak lumber in place, including spikes, fittings	60.00	75.00	80.00
800 cu.yd. conc. (1:2½:4 mix), bridges	12.00	11.00	14.00
30 cu.yd. conc. (1:2:3 mix), bridges	20.00	12.00	15.00
185 lin.ft. precast coping in place	1.00	.90	1.50
1,462 sq.ft. haydite roofing tile	.55	.50	.50
27.2 M. brick laid in place	55.00	45.00	50.00
8,800 lb. structural steel in place, pump house	.04½	.05	.06
16 steel windows 4 x 3, complete	25.00	20.00	16.00
2 double doors 6 x 7, complete	60.00	60.00	135.00
1 single door 3 x 7, complete	35.00	30.00	60.00
6,534 sq.ft. steel sheeting driven and pulled	.50	.90	.50
2,371 cu.yd. excav., unclassified, sump	1.50	1.50	2.00
405 cu.yd. conc. (1:2:3 mix), pump house	25.00	21.00	18.00
294 cu.yd. conc. (1:2½:4½ mix), intake	20.00	16.00	18.00
44,880 lb. reinforcing steel pump house	.04	.04½	.05
400 cu.yd. excav., surface of intake	1.00	1.00	3.00
Cofferdams, pumping and miscellaneous details (lump sum)	3,000.00	1.00	1,600.00
Maintaining lights, signs, barricades, etc. (lump sum)	50.00	50.00	100.00
Premium, state industrial insurance (lump sum)	800.00	1,000.00	1,200.00
	$140,516	$144,776	$146,916

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Waterworks			
Youngstown, (O.)	Dam, reservoir, purification plant, etc.	$1,592,760	Contract
Bridge			
Cincinnati	Bridge	3,500,000	Bids Asked
Railways			
Texas and New Mexico	Railway	2,000,000	Proposed
Grade Crossing Elimination			
Buffalo	Grade Crossings	1,219,806	Proposed
Piers			
Vancouver, (B.C.)	Pier	1,000,000	Contract
Power and Lighting			
Manitoba	Transmission line	1,000,000	Contract
Sports and Parks			
Chicago	Park Improvements	2,515,000	Proposed
Trenton, (N.J.)	Speedway	2,500,000	Proposed
New York	Parks and playgrounds	30,000,000	Proposed
Mills and Factories			
New Brunswick, (N.J.)	Carton Plant	1,000,000	Proposed
Buildings			
New York	Apartment	1,500,000	Separate Contracts
New York	Apartment	1,200,000	Separate Contracts
New York	Apartment	2,000,000	Separate Contracts
New York	Apartment	2,000,000	Separate Contracts
Toronto, (Ont.)	Bank	2,000,000	Proposed
New York	Y.M.C.A.	2,000,000	Bids Asked
Los Angeles	Office	2,000,000	Contract
New York	Office Bd. Educ.	1,000,000	Proposed
New York	Office	1,000,000	Proposed
Syracuse	Office, Etc.	3,500,000	Proposed
Houston	Office	1,250,000	Proposed
Hackensack, (N.J.)	Hall of Records	1,000,000	Proposed
Oakland, (Calif.)	Theatre	1,000,000	Bids Asked
Aurora, (Ill.)	Theatre	1,000,000	Contract
Davenport, (Iowa)	Theatre	2,000,000	Bids Asked

WATERWORKS

PROPOSED WORK

Ky., Lexington—Lexington Water Co., pipe line from city to Kentucky River. Community Water Serv. Co., 42 Cedar St., New York, engrs.

Mass., Cambridge — City, extending waterworks. To exceed $15,000. T. Good, City Hall, supt. Water Dpt.

N. J., Lodi—Bd. Boro Council, Boro Hall, constructing trenching, laying return water pipe from Well 7, Hamilton Ave., and from Wells 5 and 6, Linden St. to Pump House 2, and furnishing, installing air lift pumps at Wells 5, 6 and 7. $15,000. Noted Oct. 9.

N. J., Elizabeth—Bd. City Comrs., City Hall, preliminary plans main from end of pipe line in southern part Newark to North Broad and Prince Sts., Elizabeth. $300,000. T. Collins,

Tex., Houston — Drilling 3 water wells. $135,000. A. J. Sauls, City Hall, engr.

Tex., Port Arthur — Preliminary surveys 2 small pumping plants for waterworks. J. B. Converse Eng. Co., Port Arthur and Corpus Christi, engrs.

BIDS ASKED

Calif., San Francisco—Oct. 20, by L. S. Leavy, city purchs. agt., furnishing and delivering 15,000 ft. ¾ in., 2,000 ft. 1 in. and 15,000 ft. 2 in. standard weight galvanized steel pipe, threaded and coupled for mill shipment in random lengths at 639 Bryant St., for City and San Francisco Co.

Ind., Indianapolis—Oct. 20, by Bd. P. Wks., and Superintendent Municipal Airport, deep well pumping unit at airport.

Ky., Louisville—Oct. 28, by Louisville Water Co., boilers, superheaters, stokers, ash hoppers, piping, feed water equipment, filter construction work, filter equipment, J. Chambers, 435 South 3rd St., ch. engr. and supt. Alvord, Burdick & Howson, Hartford Bldg., Chicago, Ill., engrs. Noted Oct. 1.

Minn., Minneapolis—Oct. 20, by F. S. Gram, city purch. agt., 152 tons special castings for Water Dpt. N. W. Elsberg, city engr.

N. Y., Brooklyn — Oct. 17, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Prospect Park West, Flatbush, Flushing, Maspeth, Nostrand, 4th, 6th and 8th Aves., Carroll, 12th and 50th Sts.

N. Y., Colonie—Oct. 29, by Water Comrs. Lathams Water Dist., F. H. Austin, chn., Lathams, Colonie, extending waterworks. Solomon & Keis, 257 Bway., Troy, consult, engrs.; adv. E. N.-R. Oct. 16.

N. Y., Long Island City—Oct. 21, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, remodeling pumping Station 3, Union Turnpike, Queens Boro. Noted June 19.

N. Y., New York—Oct. 28, by Bd. Water Supply, G. J. Gillespie, pres., 346 Bway., five 5 x 15 ft. sluice-gates, one 8 ft. and two 6 ft. overflow-gates, thirty 6 in. plug-valves, operating mechanisms, drive-shafting, appurtenances for uptake and downtake chambers, Hill View Reservoir, Contr. 231; adv. E. N.-R. Oct. 18.

CONTRACTS AWARDED

Ia., Marquette — Waterworks improvements, incl. 10,000 ft. 4 and 6 in. c.i. pipe, fittings, fire hydrants, to K. Jeldson, Windom, Minn., $11,000.

Mass., Worcester—Water Dpt., 19,500 ft. 36 in. cement pipe line from Qinapoxet system to Kendall Reservoir, to J. J. Coughlin & Son, Inc., 27 School St., Boston, $199,750, excavating at $4.74 per cu. yd. Noted Sept. 11.

Mich., Detroit—Bd. Water Comrs., 735 Randolph St., furnishing 4th pumping unit, motor driven, centrifugal pump with auxiliary equipment, for Springwells Booster Plant, to Byron-Jackson Co., 1056 Book Bldg., $9,071. Noted Sept. 4.

Neb., Carleton—City, 50,000 gal. tank on 70 ft. tower with 4 ft. steel riser, to Omaha Steel Wks., 4802 Leavenworth St., Omaha, $5,700; 16,675 ft. 2- to 6-in. pipe with fittings, to Central Fdry. Co., 332 South Michigan Blvd., Chicago, Ill., $8,100; 19 valves and boxes, to Rensselaer Valve Co., 53 West Jackson Blvd., Chicago, Ill., $372; 19 hydrants, to Iowa Valve Co., 309 South 13th St., Omaha, Neb., $940; well, pump, motor, installation pump, motor and brick pump house, to Layne-Western Co., 405 East 13th St., Kansas City, Mo., $3,119; installing pipe lines, valves, hydrants, boxes, to Gavenman-Friedel Co., 1304 South 56th St., Omaha, Neb., $3,200. Grand total $21,431.

O., Orient—H. H. Griswold, dir. Welfare Dpt., 9th and Oak Sts., Columbus, water softener, hot water system, filter system, chemical pump, wash water pump at Orient Institution for Feeble Minded, to Henry Thompson Co., Schmidt Bldg., Cincinnati, $18,227. Noted Sept. 18.

O., Youngstown — Bd. Directors Mahoning Valley Sanitary Dist., constructing Meander Dam project, reservoir, purification plant, pumping plant, to Clemmer-Noah Constr. Co., Akron, $1,199,360, est $1,500,000; equipment for water purification plant, to Roberts Filter Mfg. Co., Darby, Pa., $393,400, est. $400,000. Noted Aug. 14.

Pa., Pittsburgh—See "Streets and Roads."

Tex., Georgetown—City, drilling several wells, incl. concreting inside of wells to where solid rock is found, also concreting ground around well (on top of ground), to A. C. Brady, Georgetown, $15,000.

Wis., Milwaukee—Dpt. P. Wks., three 2,500 g.p.m. motor driven centrifugal pumps, to Allis-Chalmers Co., West Allis, $14,575. Noted Sept. 4.

SEWERS

PROPOSED WORK

Mass., Mansfield—Town, sewerage system. To exceed $25,000. F. A. Barbour, Tremont Bldg., Boston, engr.

N. J., Ocean City—Bd. City Comrs., City Hall, sanitary sewerage system in 18th to 38th Sts. from Bay Ave. to ocean front. $250,000. W. H. Collisson, Jr., city engr. Noted Sept. 18.

Okla., Oklahoma City — Preliminary plans 16,000 sanitary sewer extensions in Country Club Addition. $50,000. G. F. Brown, City Hall, engr.

Ont., Toronto—York Twp., 8 in. vitr. tile, concrete sewers. $861,700. F. B. Goedike, 40 Jarvis St., engr.

Que., Montreal — Dpt. P. Wks., J. E. Blanchard, dir., sewers in St. Sulpice Rd., Bruxelles, Delaroche, Lajeunesse and St. Urbain Sts.

BIDS ASKED

Calif., Los Angeles—Oct. 22, by Bd. P. Wks., City Hall, sanitary sewer complete 109th St. and McKinley Ave. Sewer Dist. incl. 21,745 lin.ft. house connections, 900,000 sq.ft. resurfacing. $50,000.

Calif., Oakland—F. C. Merritt, city clk., taking bids sewers, drainage structures in Hopkins St., Midvale Ave. et al. $25,000 or more. W. N. Frickstad, city engr.

Calif., San Francisco—Oct. 29, by Bd. P. Wks., City Hall, 827 ft. 2 ft. 6 in. x 3 ft. 9 in. rein.-con. sewer, 827 ft. 6 in. vitr. clay pipe under drain, rein.-con. special structure, 2 brick or concrete manholes, 1,300 lin.ft. wood piles in Army St.

Ill., Evansville—Oct. 20, by City, City Hall, vitr. salt glazed tile sewers in Prospect Ave., Colfax and Dartmouth Places, Payne, Hayes, Noyes and Colfax Sts. A. W. Handford, pres. Bd. Local Impvts.

Ind., Richmond—Nov. 7 (extended date due to technical error), storm relief sewer. $165,000. D. B. Davis, Richmond, engr. Noted Aug. 28.

Ky., Louisville—Nov. 6, by Commissioners of Sewerage, M. H. Crawford, chn., 400 M. E. Taylor Bldg., 4th and Jefferson Sts., Goss Avenue Sewer, Contr. 51. W. M. Caye, technical engr.; adv. E. N.-R. Oct. 16.

Mass., Boston — Oct. 22, by Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Hyde Park; Oct. 24, in Dorchester, also Seminole St., Dorchester and Hyde Park; Oct. 26, in Billings Field, West Roxbury. $25,000.

N. J., Plainfield—Nov. 3, by Common Council, City Hall, 3,800 lin. ft. rein.-con. storm sewer. A. W. Vars, city engr.; adv. E.N.-R. Oct. 16.

New York — Nov. 7, by Westchester Co. Sanitary Sewer Comn., E. S. Martin, secy., White Plains, constructing Sect. J, pumping plant and appurtenances; Sect. L, plumbing system for plant for Hutchinson Project, near Hutchinson River, Mount Vernon; adv. E. N.-R. Oct. 16.

See proposal advertising on page 97

Constr. News page 157

LEADITE

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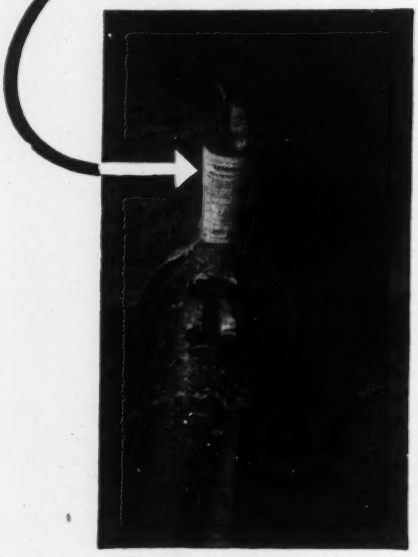
Pour the joints with LEADITE —*and "forget them"*

—because long experience has proven that LEADITE not only makes a "good, tight joint,"—but because it has also been demonstrated that LEADITE joints "improve with age."

Digging up paved streets to repair bell and spigot pipe joints is almost unknown, where LEADITE is used as a jointing material.

Further, LEADITE is Easy to handle, Melts quickly, Pours freely, and Requires no caulking. Still further, it also saves the labor item usually required for digging large bell holes, —and Reduces pumping costs in wet trenches,—"LEADITE is a Time and Money Saver."



Pouring the *Leadite* Joint.

Remember, LEADITE has been specified and used by Water Works Men most everywhere. Why not convince yourself?

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building **Philadelphia, Pa.**

No Caulking

Sewers (Continued)

N. Y., Attica—Oct. 28, at office Dpt. Correction, W. N. Thayer, Jr., comr., State Office Bldg., Albany, sewage disposal plant, outfall sewer at Attica State Prison, adv. E.N.-R. Oct. 16.

O., Akron—Comrs. Summit Co., bids about Nov. 7, Sand Run Trunk Sewer to relieve Fairlawn Dist. $46,000. E. D. Barstow, 31 North Summit St., engr.

O., Cincinnati—Oct. 21, by Comrs. Hamilton Co., Sanitary Sewer 87, Dists. 4 and 5, incl. 17,130 ft. 6- to 12-in. vitr. clay pipe, 1,000 cu.yd. rock excav. $47,773. J. S. Rafferty, Court House, engr. Noted Aug. 15.

O., Cleveland—Oct. 22, at office Commissioner Purchases & Supplies, sewers in Miles Ave. S. E., Turney Rd., S. E., East 52nd St., East 60th and East 130th Sts. R. Hoffmann, city engr.

Pa., Parkside—Nov. 5, by Boro Council, T. B. Nash, pres., at Fire Hall, 33 West Roland Rd., Schedule A, sewerage system. R. C. Wheeler, 505 Market St., Chester, Pa. and 36 State St., Albany, N. Y., engr.; adv. E. N.-R. Oct. 16.

Ont., Sarnia—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Madera—City Council, 20,316 ft. 6- to 15-in. vitr. clay sewers, 41 concrete manholes, 50 g.p.m. sewer ejector, to Thompson Bros., Fresno, $18,405.

Md., Baltimore—Bd. Awards, furnishing, installing mechanical and electrical equipment at Highlandtown Drainage Pumping Station, Eastern Ave. and Pennsylvania R.R., Storm Water Contr. 147, to Baltimore Machine Wks., 111 South Paca St., $28,549; furnishing, delivering vitr. terra cotta sewer pipe to Bureau of Sewers, Material Contr. 81, to Pen Mar Co., Munsey Bldg., $17,741. Noted Sept. 25.

Mass., Boston—Metropolitan District Comn., Constructing Sect. 114 New Neponset Valley Sewer, South Metropolitan System, to V. Barletta Co., 8 Whipple Ave., Roslindale, $106,325. Noted Sept. 25.

Mass., Boston—Metropolitan Dist. Comn., constructing Sect. 115, New Neponset Valley Sewer, South Metropolitan System, to A. Daddario, 15 Agnes Ave., Hyde Park, $91,326. Noted Sept. 25.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Goethe St., West Roxbury, to N. Cibotti, 46 Water St., Hyde Park. Est. $25,000. Noted Sept. 18.

Mich., Detroit—Dpt. P. Wks., reconstructing, Southfield Rd. sewer, to S. A. Healy Co., 6561 East Seven Mile Rd., $470,710. Noted Aug. 14.

Minn., Fairmont—Sewage disposal plant, to Arnold Constr. Co., 803 Guardian Life Bldg., St. Paul, $19,939. Noted Oct. 2.

N. J., Roselle Park—Boro Council, Boro Hall, sanitary sewers in Aldene Section, to C. Salvator & Co., 390 High St., Orange, $30,623.

Pa., Erie—See "Streets and Roads."

Pa., Pittsburgh—See "Streets and Roads."

Ont., Toronto—Sewers in lane near Eastern Ave. and in Central Harbor Development, System B, Church St., to Ruscica Bros., 84 Woodycrest Blvd., $1,549 and $14,948 respectively; Central Harbor Development, System A, Keating St., to P. Mohan, 232 Withrow Ave., $24,283. Grand total $40,780. Noted Oct. 2.

Ont., Sarnia—City Council, Exmouth Street Sewer, day labor. $190,000. A. Beatty, city engr.

Ont., Woodstock—City Engineer, 8,588 ft. 15- to 48-in. concrete pipe for sewer, to Independent Concrete Pipe Co. Ltd., 198 Riddell St. laying pipe, day labor. Est. $60,000. Noted Sept. 25.

BRIDGES

PROPOSED WORK

Calif., Los Angeles—Los Angeles Co., rein.-con. arch span bridge, consisting one 100 ft. rein.-con. arch span, overall width 100 ft., 74 ft. roadway over Alhambra Wash, at Pomona Blvd. W. H. Armstrong, co. bridge engr.

Mass., Newburyport—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, concrete, steel bridge over Merrimac River. Est. exceeds $25,000. A. W. Dean, Dpt. P. Wks., Boston, engr.

Okla., Adair—State Hy. Dpt., Oklahoma City, preliminary plans 1 span 110 ft. steel truss bridge on concrete piers, Mayes Co. $30,000. A. R. Losh, ch. hy. engr.

BIDS ASKED

Alabama—Oct. 21, by State Hy. Dpt., Montgomery, W. Finnell, dir., overhead bridge, on State Project 464-A, Coffee Co.; approaches to Rocky Creek Bridge, State Aid Project 184, Winston Co.

California — Oct. 29, by State Hy. Comn., Sacramento, one 35 ft. and one 22 ft. span bridge on concrete pile bents over Redwood Slough near Redwood City, San Mateo Co.; one 42 ft., two 31 ft., one 30 ft. 10 in. and one 30 ft. 2 in. span bridge on concrete bents over Atchison, Topeka & Santa Fe Ry. at Manhattan Beach, Los Angeles Co. C. H. Purcell, state hy. engr.

Calif., Los Angeles—Oct. 27, by Supervs. Los Angeles, 100 ft. rein.-con. arch span bridge, 100 ft. wide, 74 ft. roadway, over Alhambra Wash, on Pomona Blvd.

Fla., Inverness—Oct. 20, by Comrs. Citrus Co., J. K. Kelly, chn., 500 ft. steel I-beam bridge over Withlacoochee River, east of here, E. V. Camp & Associates, Inc., Moreland and DeKalb Avenues, Atlanta, Ga., engrs.

Ill., Chicago—Oct. 20, by City, at office Dpt. P. Wks., City Hall, filled approach and street adjustments to North Wabash Ave. double leaf trunion bascule bridge. Former bids rejected. R. W. Wolfe, comr.

Indiana and Kentucky — Oct. 28, by J. J. Brown, dir. State Hy. Comn., Indianapolis, Ind., Contr. 1, 5 main river piers A to E (inclusive), limestone, concrete on rock strata underlying the river bottom, Contr. 2, metal work in superstructure of main river bridge, roadway paving on metal work from Pier A to Pier E, 10 navigation light fixtures, for bridge over Ohio River from Evansville, Ind., to Henderson, Ky.; Oct. 30, Contr. 3, masonry supports, abutments and piers of Indiana and Kentucky approaches, Contr. 4, metal work in superstructure, roadway paving of Indiana and Kentucky approaches, $4,000,000. R. Modjeski & E. F. Master, Keystone Bldg., Harrisburg, Pa., 369 Lexington Ave., New York, and 1420 Walnut St., Phila., Pa., engrs. This corrects report in Oct. 1 Daily and Oct. 2 Weekly.

N. H., Bath—Oct. 16, by State Hy. Dpt., Concord, rein.-con. slab bridge.

N. J., Mantoloking—Bd. Freeholders Ocean Co., Court House, Toms River, bids about Oct. 15, creosoted timber, steel bridge with jackknife draw, power operated, across Barnegat Bay from here to West Mantoloking. $250,000. H. C. Shinn, Lakewood, co. engr. Noted Mar. 13.

O., Cincinnati—Oct. 20, by Cincinnati Union Terminal Co., H. M. Waite, ch. engr., Temple Bar Bldg., 58 span, 4,000 ft., rein.-con. bridge, Central Parkway, to Harrison Ave., for City and Cincinnati Union Terminal Co. $3,500,000. Noted Oct. 2.

Pa., Pittsburgh—Oct. 28, by J. G. Armstrong, chn. Bd. Comrs. Allegheny Co., Bridges 2, 4 and 7 over Kilbuck Run, near Sewickley, incl. removing existing bridges, new bridges, approaches, 250,000 lb. reinforcing steel, $8,000—135,000 lb. cast steel, 5,000,000 lb. copper bearing silicon steel, 8,121,000 lb. copper bearing carbon steel, chromo nickel iron, for West End—North Side Bridge, $893,000—bridge over Youghiogheny River at Boston Village, 4,546 sq.yd. stone faced masonry, concrete backing, waterproofing stone drains, 160,000 lb. sheet piling, 2,000 lin.ft. 16 in. pipe caissons, removing 15 buildings, $235,000 — removing present bridge, new rein.-con. granite veneer, waterproofing steel substructure at South 10th St., $908,000. V. R. Covell, 519 Smithfield St., engr.

Texas—Oct. 21, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges on Hy. 14, Federal Aid Project 569-B and State Project 873-B, Navarro Co. $25,000.

Texas—Oct. 21, by G. Gilchrist, state hy. engr., Austin, steel, concrete bridge over Nueces River and 5 relief bridges, Hy. 145, State Project 931-G, Live Oak Co. $130,000.

Texas—Oct. 20, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges, on Hy. 10, Federal Aid Project 584-B, Brown Co., $36,000; on Hy. 10, Federal Aid Project 580-A, $60,000.

Wisconsin—See "Streets and Roads."

Tex., Houston—Oct. 22, by City, 3 span, 120 ft. concrete on timber foundation pile bridge over Brays Bayou, Almeda Rd. $40,000. J. G. Nagle, Houston, engr. Noted Oct. 2.

Tex., Runge—Oct. 20, by State Hy. Dpt., G. Gilchrist, hy. engr., Austin, 240 ft. concrete, earth underpass, 24 ft., and 7 in. concrete paving ¼ mi. road, on Hy. 72, near here, Karnes Co., for State Hy. Dpt. and Karnes Co. (Karnes City). $45,000.

Ont., Sarnia—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Nicolaus—A. B. Brown, clk, Sutter Co. (Yuba City), reconstructing bridge over Feather River, incl. center pier with 2 steel spans on each end of pier, to Ward Eng. Co., 315 Montgomery St., San Francisco, $36,699. Noted Sept. 18.

Ill., Belleville—St. Clair Co., c/o Bd. Supervs., Court House, rein.-con. viaduct on Caseyville-Collinsville Rd. at Pennsylvania R.R., near here, to Johnson Constr. Co., Belleville, $107,864, exclusive of cement which will be furnished by state at $42,134.

Ill., Chicago—Illinois Central R.R. Co., 135 East 11th Pl., A. F. Blaess, ch. engr., caisson foundations for viaduct 128 ft. wide, in connection with railroad station, Randolph St., to R. T. Hanrahan, c/o owner, 1200 South Michigan Ave. Noted Aug. 7, under "Buildings-Unclassified."

Kentucky—See "Streets and Roads."

Michigan — C. L. Cowgill, resident engr., Plymouth, FR1 of 47-6-23, steel deck girder, 2 rein.-con. abutments, Contr. 1, to Massillon Bridge & Structure Co., Massillon, O., $4,173; Contr. 2, to B. C. Lord, Clayton, $22,210 incl. cement, for State Hy. Comn., Lansing. Noted Sept. 18.

Michigan—Washentaw Co. Rd. Comn., Ann Arbor, R. B. 1 of 81-4-20, Contr. 1, two 55 ft. steel deck girder spans, Contr. 1, to Elkhart Bridge & Iron Co., Elkhart, Ind., $3,300; Contr. 2, to Ann Arbor Constr. Co., Ann Arbor, $23,453 incl. cement. Noted Sept. 11.

Montana—State Hy. Comn., Helena, 297 ft. bridge over Little Powder River, and 8 timber trestles on Broadus-Wyoming line Rd., Powder River Co., to E. R. Hays, Bozeman, $18,974; reconstructing Clear Creek Bridge, Dawson Co., to Mougey & Whitaker, Bozeman, $3,861.

New York — A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, altering Manhattan and Brooklyn Bridge Plazas of vehicular roadway for westerly upper deck, Manhattan Bridge, to E. O. Roberts Co., 52 Vanderbilt Ave., New York, $206,000. Noted Aug. 28.

Texas, Fort Worth—Tarrant Co., c/o W. E. Yancy, aud., rein.-con. bridge over West Fork Trinity River on Purvis Rd., to J. P. Foty, Burt Bldg., Dallas, $49,300. Est. $50,000.

West Virginia—State Hy. Comn., Charleston, Land Graf Bridge, in McDowell Co., to Thompson & Evans, Barboursville, $22,922—Laurell Bridge, Ritchie Co., to A. B. Peraldo & Son, McFarlan, $20,929—Oxbow Bridge, Ritchie Co., to Starcher & Anglin, Buckhannon, $19,986. Grand total $63,887. Noted Sept. 18.

Ont., Chatham—W. G. George, Bank of Commerce Bldg., concrete substructure for double leaf bascule bridge over Thames River at 5th St., to Chatham Dredging Co., Ltd., 96 King St. W., $63,480. Total est. $250,000. Noted Oct. 2.

Ont., Paris—Dpt. P. Hys., Parliament Bldgs., Toronto, 1,200 ft. hy. bridge over Grand River, to E. P. Muntz Ltd., Temple Bldg., Toronto. Est. $250,000. Noted May 8.

Ont., Sarnia—City Council, steel bridge over St. Clair Tunnel, South Vidal St., day labor, $40,000. A. Beatty, city engr.

STREETS AND ROADS

BIDS ASKED

Arizona—Oct. 24, by State Hy. Comn., grading, constructing overpass on 2 mi. Florence-Tucson Hy., Pinal Co. W. W. Lane, Phoenix, state engr.

Calif., Los Angeles—See "Sewers."

Calif., Los Angeles—Oct. 27, by Bd. Supervs. Los Angeles Co., grading, drainage structures 9-7-7-9 in. concrete paving 75,000 sq.ft., concrete paving 37,800 sq.ft., R and O wearing surface paving 11,260 sq.ft. La Brae Ave.—grading, curbing, guttering, 2 in. asphaltic concrete paving 38,700 sq.ft. Western Ave.—grading rock base alternate types paving, Main St.

Calif., Monterey Park—Oct. 27, by City Council, improving Garvey Ave., incl. street lighting, 452,000 sq.ft. 9-7-9 in. concrete paving, 486,000 sq.ft. D.G. sub-base.

Ga., Cuthbert—Oct. 27, by R. A. Patterson, mayor and Bd. Aldermen, City Hall, grading, sewers, paving 10,272 sq.yd. Dawson, Pearl, College, Plum, Peachtree, Depot and Court Sts. J. B. McCrary Eng. Corp., Citizens & Southern Bank Bldg., Atlanta, engrs.

Idaho — Oct. 21, by J. D. Wood, comr. P. Wks., Boise, grading, 4.602 mi. Grays Lake Hy., Caribou Co.—10.242 mi. Raft River Hy., Cassia Co.—1.988 mi. Payette Hy., Gem Co.

Ill., Chicago—Oct. 21, by City at office Bd. Local Impvts., City Hall, grading, curbing, guttering, sewers, asphalt on 6 in. concrete paving Albion Ave., East 98th and Ainslie Sts.—grading, curbing, guttering, sewers, 8 in. concrete paving West 97th Pl., Gregory St., Cornelia, Cullom, Kongee, North Lamon, Wilson, Berwyn, North Leamington, Marquette and Mainstree Aves. — grading, reshaping present macadam pavement to serve as foundation, asphaltic concrete repaving South Leavitt St. and Sidney Ave. M. J. Faherty, pres.

Kansas—Oct. 21, by State Hy. Comn., Topeka, at Court House, Eureka, grading, culverts 6.053 mi. K11, Federal Aid Project 322-E, Greenwood Co., incl. 4.585 ft. hedge, 37,300 lb. steel. W. V. Buck, hy. engr.

Maryland—Oct. 21, by State Roads Comn., Baltimore, penetration macadam resurfacing 1.1 mi. Contr. F-160-52, Frederick Co. G. C. Uhl, chn.; adv. E. N.-R. Oct. 16.

Massachusetts—Oct. 21, by Dpt. P. Wks., Boston, gravel and bituminous macadam paving 1,850 ft. hy Mendon; bituminous macadam paving 2,600 ft. hy., Lenox. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston—Oct. 22, by Dpt. P. Wks., J. A. Rourke, comr., granite block paving E St., Ward 6. $25,000.

Mass., Boston—Oct. 22, by Dpt. P. Wks., sheet asphalt or bitulithic paving Navarre St., Ward 18; Oct. 24, Gilmer St., Ward 14. $25,000. J. A. Rourke, comr.

Mo., Clayton — Oct. 22, by St. Louis Co. Court, grading, concrete paving 1 mi. Jennings Station Rd. from Natural Bridge Rd. to Ledore Lane. R. Jablonsky, Clayton, co. engr.

Neb., Omaha—Oct. 21, by G. Berger, clk. Douglas Co., concrete paving 11,966 sq.yd. Locust St.

N. Y., Brooklyn—Oct. 22, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, granite block on 6 in. concrete paving North 9th St.—grading West 6th St., Troy and 15th Aves.—grading, curbing, asphalt on 6 in. paving Dahlgren Pl., Farragut and Beverly Rds., Albany, Livonia, Nassau, Tilden Aves., West 5th, Van Sicklen, Knapp, East 43rd, East 42nd, East 27th, and Bay 10th Sts.

N. Y., Long Island City—Oct. 23, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, sheet asphalt on macadam paving Fresh Meadow Rd., Queens Ave. — grading, curbing, stone guttering, 84th St. — grading, curbing, sidewalks, sheet asphalt on concrete paving Hamilton Pl., 95th and 43rd Aves., 136th, 126th Sts.

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And as Brixment requires no soaking or slaking, it can be mixed from day to day in any quantity needed. This eliminates the danger of losses due to rain, freezing or unused batches. Louisville Cement Company, Incorporated, Louisville, Kentucky.

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BRIXMENT

For MASONRY and STUCCO

Streets and Roads (Continued)

N. Y., New York—Oct. 20, by J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, granite block on concrete paving 9th Ave.—grading, sheet asphalt on concrete paving Maiden Lane—widening, sheet asphalt on concrete paving West End Ave. from 79th to 96th Sts., granite block on concrete paving from 96th to 99th Sts.

N. Y., Yonkers—Oct. 27, by C. MacDonald, engr. Westchester Co., Court House, White Plains, improving Central Park Ave., County Rd. 47-11, incl. grade separation structural at Palmer Ave.; adv. E. N.-R. Oct. 16.

O. Cincinnati—Oct. 17, by Comrs. Hamilton Co., grading, curbing, sidewalks, concrete repaving 9,500 sq. yd. Race Rd. from Cincinnati-Louisville to Harrison Rds. $41,014. E. A. Gast, Court House, engr.

Okla., Oklahoma City—Oct. 21, by J. W. Berry, clk. Oklahoma Co., concrete slab surfacing 5 mi. West G Avenue Rd., $100,000—2 mi. Britton Rd., $44,000—5 mi. May Avenue Rd., $100,000—3 mi. West 10th Street Rd., $120,000—5 mi. East 29th Street Rd., $100,000, all 18 ft. wide. J. F. Frazier, Court House, engr.

Okla., Tulsa—Oct. 23, by Park Bd., Municipal Bldg., fine grading 10-7-10 in. paving 14,913 sq.yd. Mohawk Blvd. $35,046. H. A. Park, Municipal Bldg., engr.

Pa., Pittsburgh—Oct. 28, by J. G. Armstrong, chn. Bd. Comrs. Allegheny Co., grading, curbing, guttering, sidewalks, sewers, watermains, concrete paving 9,000 sq.yd., vitr. brick paving 12,000 sq.yd. Ohio River Blvd. $161,000. E. A. Griffith, 519 Smithfield St., engr.

Rhode Island—Oct. 24, by State Bd. P. Roads, Providence, bituminous macadam, penetration method paving 1.89 mi. Contr. 3033; 86 mi. Contr. 3034; adv. E. N.-R. Oct. 16.

Texas—Oct. 20, by G. Gilchrist, state hy. engr., Austin, grading, drainage structures 7.311 mi. Hy. 8, F.A.P. 599, Panola Co., 26 ft. $64,000.

Texas — Oct. 20, by G. Gilchrist, state hy. engr., Austin, concrete paving 3.896 mi. State Hy. 15, Federal Aid Project 363-E, Unit 2, Van Zandt Co., 18 ft. $100,000.

Texas—Oct. 20, by Gilchrist, state hy. engr., Austin (**F.A.P. means Federal Aid Project**), grading, drainage structures 6.328 mi. Hy. 21, F.A.P. 490 B, Unit 2, Madison Co.—11.896 mi. Hy. 12, F.A.P. 572 A and B, Bee and San Patricio Counties, $65,000—4.833 mi. Hy. 35, F.A.P. 125, reopened, Liberty Co., $36,000—19.599 mi. Hy. 10, F.A.P. 584-B, Unit 1, Brown Co., $120,000, all foregoing 26 ft.

Texas — Oct. 21, by G. Gilchrist, state hy. engr., Austin, grading, gravel surfacing 15.206 mi. State Hy. 11, State Project 501-A, reopened, and 501-B, Hopkins Co., $80,000; grading, drainage structures 9.375 mi. State Hy. 137, State Project 936-B, Ector Co., $25,000, both 26 ft.

Texas—Oct. 21, by G. Gilchrist., state hy. engr., Austin, grading, drainage, structures 2.934 mi. Hy. 35, Harris Co., 26 ft., $64,000—3.982 mi. Hy 14, Navarro Co., 26 ft., $48,000—limestone rock asphalt on concrete surface treating 5.23 mi. Hy. 12-A, Neuces Co., 18 ft., $120,000.

Tex., Houston—Oct. 22, by City, c/o W. E. Monteith, mayor, 1½ in. on 6 in. concrete paving 11,000 sq.yd. South MacGregor Dr., from Southland Terrace to Scott St., $47,640. J. M. Nagle, Houston, engr. Noted Oct. 9.

Tex., Runge—See "Bridges."

Wash., Seattle—Oct. 27, by Comrs. King Co., grading, graveling 3 mi. Des Moines-Military Rd., 28 ft.—1.3 mi. Vashon Rd.—1 mi. Maple Valley Hy. Bids to have been received Sept. 29 for above cancelled. T. D. Hunt, co. engr. Noted Sept. 18.

W. Va., Beckley—Oct. 22, by City Council, grading, 45,000 cu.yd. Prince St. H. M. Scott, Beckley, engr.

Wisconsin — Oct. 21, by State and Monroe Co. Hy. Comns., Court House, LaCrosse, crushed stone surfacing 9.181 mi. Cashton-Ontario Rd., S.T.H. 33, F.A.P. 448-C—also Langon, Rumppe, Williams, Sheldon, Olson and Stoddard Bridges—bridges at Sta. 125a plus 50 and 132a plus 80.

Wisconsin—Oct. 22, by State and Taylor Co. Hy. Comns., 213 South Barstow St., Eau Claire, grading 2.759 mi. Medford-Chelsea-Prentice Rd.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading, surfacing 7.4 mi. Ash Fork-Kingman Hy., to M. H. Slocum, 2064 Dudley St., Pasadena, Calif., $80,057. Noted Sept. 11.

Ark., Forrest City—Bd. Comrs. North and South Washington Street Impvt. Dist., grading, curbing, guttering, concrete paving, to Hogan Constr. Co., Home Insurance Bldg., Little Rock, $101,893.

Ark., Little Rock—Grading, storm sewers in 4,000 ft. Street Impvt. Dist. 515 (Normandy Addition), 24 ft., to McEachin & Luke, Ft. Smith, $30,956.

Calif., San Diego—See "Airports."

Calif., San Diego — City Council, clearing, grubbing, culverts, drainage structures, grading 341,600 cu.yd. Torrey Pines Rd., to Daley Corp., 4430 Boundary St., $112,032.

Idaho—J. D. Wood, comr. P. Wks., Boise, Idaho, concrete paving 0.417 mi. road and 200 ft. concrete bridge on Payette Hy., west of McCall, Valley Co., to C. F. Dinsmore & Co., Ogden, Utah, $33,640. Est. $41,610. Noted Sept. 19.

Idaho — J. D. Wood, comr. P. Wks., Boise, grading, bridging 0.417 mi. Valley Co., to C. F. Dinsmore & Co., Ogden, Utah, $33,640 est. $41,610—crushed graveling 5 mi. Lemhi Co., to J. J. Fuller, Vale, Ore., $12,630 est. $11,360—8.7 mi. Boundary Co., and crushed rock surfacing 8.4 mi. Lewis Co., to Triangle Constr. Co., 1220 Ide St., Spokane, Wash., $17,648 and $20,230 respectively, est. $22,049 and $16,300 respectively — constructing roadbed, drainage structures, 5.448 mi. Lincoln Co., to Utah Constr. Co., Ogden, Utah, $28,925 est. $29,074. Grand total $113,073.

Idaho—State Hy. Dpt., Boise, crushed rock repaving 8.4 mi. Clearwater Hy. and 2 mi. Lewis and Clark Route, also crushed gravel resurfacing 8.7 mi. North and South Hy. north from Bonners Ferry, to Triangle Constr. Co., Spokane, Wash., $20,230 and $17,647 respectively—graveling 3.5 mi. road north from Jerome, to W. M. Devlin, Mountain Home, $8,775; reflooring Kamiah Bridge, to J. Kenyon, Lewiston, $6,645. Grand total $53,297.

Indiana — State Hy. Comn., Indianapolis, grading, culverts, concrete surfacing 5.4 mi. Dunes Relief Rd., Laporte Co., to M. E. Heiny, Gary, $216,684 est. $267,109; 4 mi. Roads 24 and 30, Allen Co., to R. L. Harris, Ft. Wayne, $88,636.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures 5.842 mi. roads in Estill Co., to Codell Constr. Co., Winchester, $115,101 — 9.499 mi. Logan Co. to Kaiser Transp. Co., Buechal, $77,590 — constructing Bullskin Creek Bridge, approaches, Shelby Co., to Jenkins Constr. Co., Elizabethtown, $27,756. Grand total $220,447. Noted Sept. 18.

Louisiana—State Hy. Comn., Baton Rouge, concrete surfacing 7.5 mi. Jefferson Hy., Avoyelles and Rapides Parishes, to Forcum James Co., Dyersburg, Tenn., $198,273—gravel surfacing 3.2 mi. Luma-Viken Hy., Ouachita Parish, to Wimberly Constr. Co., Arcadia, $21,390—10.4 mi. Baton Rouge-New Orleans Hy., Ascension Parish, to Southern Constr. Co., New Orleans, $37,964. Grand total $257,627.

Maryland—State Roads Comn., Baltimore, graveling, 1.14 mi. Contr. Sm-73-82, St. Mary's Co., to Southern Maryland Contg. Co., 20 East Lexington St., Baltimore, $8,409. Noted Sept. 4.

Md., Baltimore—Bd. Awards, concrete paving 10,800 sq.yd. alleys, Alley Contr. 142, to T. Fratta, 3501 East Pratt St., $19,055—9,650 sq.yd. streets Contr. 562, to Mahoney Bros., 1111 Rutland Ave., $20,417—grading 40,000 cu.yd. streets Contr. 564, to H. O. Firor, 3508 Liberty Heights Ave., $11,600—sheet asphalt paving 7,500 sq.yd. streets Contr. 563, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., $30,199. Grand total $81,271. Noted Sept. 25.

Massachusetts—Dpt. P. Wks., State House, Boston, rein.-con. paving 4,000 ft. and bituminous macadam paving 200 ft. hy. Dedham, to B. Perini & Sons, Inc., Ashland, $54,048. Noted Sept. 25.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Ormond St., Dorchester, to Appel & O'Toole, 78 Moreland St., Roxbury, $23,297. Est. $25,000.

Mass., Boston — Dpt. P. Wks., bitulithic paving River St., to A. Singarella, 22 Tremlet St., Dorchester, $42,429.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Crescent Ave., Dorchester, to J. J. McCarthy, 121 Boston St., Dorchester, $30,231.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Rogers Park Ave., Ward 22, to S. J. Tomasello, 15 Bay St., Dorchester, $21,292., Est. $25,000. Noted Oct. 2.

Mass., Waltham—Bd. Selectmen, granolithic walks on Common St., to J. C. Regan, 220 Pleasant St., Marblehead, at $2.85 per sq.yd.

Michigan — R. A. Beers, resident engr., Kalamazoo, grading, concrete paving 2.514 mi. MO3-21 Contr. 1 and MO3-22, Contr. 1, Allegan Co., to K. B. Olson, Paw Paw, for State Hy. Comn., Lansing, $64,447, incl. cement. Noted Aug. 21.

Michigan—C. L. Cowgill, resident engr., Plymouth, grading, concrete paving 3.632 mi. FO58-20 Contr. 1, Monroe Co., 40 ft., to W. H. Knapp, Monroe, $201,747 incl. cement; 6.165 mi. FO47-18 Contr. 1, Livingston Co., 20 ft., to L. L. Clymer, Linden, $214,519 incl. cement, for State Hy. Comn., Lansing. Noted Sept. 18.

Michigan — C. L. Cowgill, resident engr., Plymouth, grading, concrete paving 2.468 mi. MO58-19C-1, Monroe Co., 20 ft., to Bartling & Dull, Pontiac, for State Hy. Comn., Lansing, $80,557 incl. cement. Noted Aug. 14.

Michigan — Division Engineers Office, Escanaba, grading, concrete paving, 2.268 mi. MO2-15, Contr. 1, Alger Co., and 3.297 mi. FO22-25, Contr. 1, Dickinson Co., both 20 ft., to Bacco Constr. Co., Iron Mountain, for State Hy. Comn., Lansing, $89,109 and $123,097 respectively, both incl. cement. Noted Sept. 18.

Michigan—At office H. C. Fleming, resident engr., 213 Watson Bldg., Grand Rapids, gravel surfacing 4.009 mi. MO64-8, Contr. 1, 16 ft., Oceana Co., to Pickitt & Goodwin Bros., Allegan, for State Hy. Comn., Lansing, $43,341, incl. cement. Noted Sept. 11.

Michigan—G. H. Greene, resident engr., Alpena, grading, concrete paving 4.83 mi. FO-65-12C-1, Ogemaw Co., and 6.118 mi. FO6-18 Contr. 1, Arenac Co., 20 ft., to C. G. Milne, Saginaw, for State Hy. Comn., Lansing, $154,613 and $164,434 respectively, both incl. cement. Noted Sept. 11.

Michigan—R. R. Havens, resident engr., 808 Central State Bank Bldg., Jackson, grading, shaping, concrete paving 1.164 mi. MO46-27 Contr. 1, Lenawee Co., 20 ft., to E. L. McGuieston & T. H. McArdle, Ionia, for State Hy. Comn., Lansing, $43,225, incl. cement.

Mo., Clayton—St. Louis Co., Court House, rein.-con. paving 4,005 ft. Litzinger Rd. and 1,327 ft. Pennsylvania Ave., to Skrainka Constr. Co., Security Bldg., St. Louis $34,956 and $13,503 respectively—Ballas Rd., to Steuby Constr. Co., Kirkwood, $80,070—Marshall Rd. to Kelley Bros. Contg. Co., 4301 State St., East St. Louis, Ill., $153,613—855 ft. Southwest Ave. to C. M. Berry, 2732 Sutton Ave., Maplewood, $4,200—bituminous concrete paving 7,654 ft. Old Florissant Rd., to Bangert Bros. Constr. Co., 44 A. South Florissant Rd., Ferguson, $36,406—bituminous concrete on sledge stone surfacing 72,000 ft. Hibler Rd., to C. N. Lund, 114 North 7th St., St. Louis, $34,080—rein.-con. paving 320 ft. Julian Ave., to E. Fehlig & Co., Inc., 14 South Central Ave., $3,150—1,950 ft. Sutter Ave., to H. B. Davison, 6734 Scanlon Ave., St. Louis, $6,761. Grand total $366,739. Noted Oct. 2.

Mo., St. Louis — Bd. P. Serv., City Hall, grading between building lines Chippewa St. and Hampton Ave., to S. Kraus Co., 645 Edmund St., $6,580 and $8,439 respectively—Hampton Ave., to Mills Drayage Co., 2817 Easton Ave., $10,891—Hampton Ave., to Webb-Boone Paving Co., 5103 Fyler Ave., $29,787—grading, concrete paving alley in City Block 2862, to Perkinson Bros. Constr. Co., 3237 Carter Ave., $1,429. Grand total $57,126. Noted Sept. 4.

Montana—State Hy. Comn., Helena, graveling 13.712 mi. Miles City-Terry Rd., to Collison & Dolven, Billings, $34,557—grading 19.282 mi. road Liberty and Hill Counties, to Tomlinson, Arkwright Constr. Co., Great Falls, $53,529—8.725 mi. Jefferson Co., to S. Orino, Realty Bldg., Spokane, Wash., $177,206—14.303 mi. Big Horn Co., to F. C. and D. Constr. Co., Billings, $54,492—grading, graveling 5.77 mi. Lake Co., to Buck Helean, Missoula, $50,346. Grand total $370,130.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, curbing Richmond Terrace, to Vanbro Constr. Co., 24 Elizabeth St., Port Richmond, $34,169. Noted Sept. 18.

N. Y., St. George—J. Lynch, pres. Richmond Boro, Boro Hall, bituminous concrete paving Guyon Ave., to C. M. Bristow, Lyndhurst, N. J., $32,672 — Treadwell Ave., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $9,055—Victory Blvd. and Oak Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $5,450 and $16,711 respectively. Grand total $63,888.

N. D. Bismarck—City, M. H. Atkinson, and warrenite bitulithic 21,900 sq.yd. Paving Dist. 11, Front St. between 3rd and 12th Sts., to Haggart Constr. Co., Fargo, at $2.60 per sq.yd. total $74,234.

O., Cleveland — Paving Madison Ave. and West 117th St., to Highway Constr. Co., Builders Exch. Bldg., $10,072 and $14,698 respectively.

Pennsylvania—State Hy. Dpt., Harrisburg, to Holmes Constr. Co., Wooster, O., grading, concrete surfacing 27,400 sq.yd. roads in Beaver Co., $142,786—to D. W. Davis & Sons, Kingston, 11,453 sq.yd. Sullivan Co. $68,421 — to G. S. Mellert & Widener Co., Medina, O., 5,402 sq.yd. Mercer and Crawford Counties $22,212; 10,740 sq.yd. Crawford Co. $44,122, 50,580 sq.yd. Erie Co. $187,738. Grand total $465,279. Noted Sept. 13.

Pennsylvania—State Hy. Dpt., Harrisburg, grading, concrete surfacing 10,113 sq. yd. roads in Somerset and Cambria Counties, to Windber Constr. Co., Windber, $65,951—3,650 sq. yd. Lancaster Co., to J. M. Eshelman, Lancaster, $27,737—grading, bituminous surfacing 3,300 sq. yd. Dauphin Co., to Diehl, Hermsberger and Wishard, Green-castle, $22,059. Grand total $115,747. Noted Sept. 13.

Pa., Erie—Grading, paving Payne Ave., 7th, 8th, 9th and Elliott Sts., to J. and M. Doyle, 307 Walnut St., $28,686.

Pa., Erie—M. J. Henry, city clk., to J. and M. Doyle, 307 Walnut St., grading, paving, curbing 3rd and Moorhead Sts., $19,600. Mill and Holland Rds. est. $45,000. Sect. K Main Street Sanitary Sewer $10,500; to J. McCormick, 1345 West 10th St., grading, curbing, paving Hill Rd. from east line Peach St. to Glenwood Park, $6,000. Noted Oct. 2.

Pa., Greensburg — One course rein.-con. paving 1,966 ft. West Pittsburgh and Archer Sts., 36 to 46 ft., to Wilmerding Constr. Co., Wilmerding, $47,800.

Pa., Oil City — Grading, curbing, rein.-con. paving 5,585 sq.yd. Cedar St., to Lesher-Fehrech Co., 920 West 1st Ave., $18,500.

Pa., Pittsburgh — Bd. Comrs. Allegheny Co., City County Bldg., to M. O'Herron Co., South 1st and McKean Sts., grading, curbing, guttering, sidewalks, vitr. brick repaving 410 sq.yd., sheet asphalt on concrete paving 2,200 sq.yd. Edgerton Ave., $13,625; grading, asphalt on concrete paving 200 sq.yd., and repaving 200 sq.yd., also bituminous macadam paving 1,735 sq.yd. Frick Woods Rd., $7,366; grading, sidewalks, curbing, guttering, concrete paving 3,092 sq.yd. Baldwin Rd., $17,760; grading, curbing, guttering, sidewalks, blockstone on concrete paving 700 sq.yd., rein.-con. paving 1,250 sq. yd. Braker St., $12,527—to A. F. Jordano, 2886 West Liberty Ave., 1,730 sq.yd. Muriel St., $13,993; 1,200 sq.yd. Grant St., $18,147—to F. D. Sancits & Sons, 410 Marlow St., grading, curbing, paving Center Ave., $19,965—to C. T. Martino, 15 McKnight St., 770 ft. 15 in. terra cotta sewer pipe, 500 lb. steel and intersection chamber, Belvedere St., $2,760 — to

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Streets and Roads (Continued)

Dunn & Ryan, 3916 Swineburn St., 420 ft. 21 and 15 in. terra cotta pipe, 13 catch basins and paving Stratmore St. and Apple Ave., $3,458—to Franklin Electric Co., 117 1st Ave., electric work for secondary sub-station and control apparatus, $4,345. Grand total $113,946.

Tex., Brownwood—Paving 15,000-16,000 yd., to Pagoe Constr. Co., Denton, $36,000.

Tex., Nacogdoches—City, paving 2 mi., to T. L. James Constr. Co., Ruston, La. Est. $75,000.

Virginia—State Hy. Comn., Richmond, grading, draniage structures 6.196 mi. roads in Gloucester, King and Queen Counties, to Spottsylvania Constr. Co., Inc., Highland Springs, $19,887. Noted Sept. 25.

Wash., Seattle—Comrs. King Co., grading, bridging, graveling 6,100 ft. Marine Dr., to Hallstrom & Hallstrom, Leary Bldg., $55,000. Contractor will take bids Oct. 15, pile driving, 1,000-1,200 ft. 12-to 30-in. concrete pipe, rough lumber, reinforcing steel, structural steel, gas shovel, painting, road equipment, 100,000 cu. yd. excav., 254 ft. rein.-con., steel bridge, est. costs $29,000.

Wash, Seattle—Bd. P. Wks., filling Fairview Ave., to A. C. Goerig, 413 Fairview Ave. N., $35,511. Noted Oct. 9.

West Virginia—State Hy. Comn., Charleston, widening, surfacing roads in Greenbrier Co., to Clark & Lewis, Luray, Va., $16,021—Lincoln Co., to A. A. Bostic & Co., Huntington, $129,-306—Monongalia Co., to Bartlett Constr. Co., Grafton, $11,455—Monroe Co., to R. W. Moore & Co., Staunton, Va., $11,480—Pocahontas Co., to F. C. Sammons & Co., Huntington, $110,123—Taylor Co., to Branham & Edwards, Clarksburg, $91,842. Grand total $370,227. Noted Sept. 18.

Wyoming—State Hy. Comn., Cheyenne, grading 5.095 mi. Park Co., to Wilson & Welch Constr. Co., Cowley, $14,530—reconstructing 2 bridges, and surfacing 10.87 mi. road Albany Co., to H. A. Swenson, Laramie, $6,277 and $11,160 respectively—15.5 mi. Laramie Co., to Tyler & Baker, Cheyenne, $11,500—7.339 mi. Hot Springs Co. and 7.839 mi. Big Horn and Park Counties to Taggart Constr. Co., Cody, $8,405 and $14,500 respectively—5.721 mi. Big Horn Co., to Threet Bros., Lovell, $17,766—3 mi. Johnson Co., to Watt Bros., Buffalo, $4,626—grading, constructing 2 bridges in Uinta Co., to G. M. Carruth & Son, $12,500—constructing maintenance building Johnson Co., to Nicoloson & Frees, Buffalo, $2,973. Grand total $104,237. Noted Sept. 18.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ill., Chicago—See "Sports and Parks."

Ont., Ottawa—City, Gloucester Twp., Province of Ontario and Federal Govt., flood prevention work, incl. dam, dykes, clearing river bed, dredging in Rideau River between Billings and Cummings Bridges. $750,000. A. F. McCallum, city engr. Noted Mar. 27.

BIDS ASKED

Calif., Richmond—Oct. 25, by R. A. Beebe, engr., 1 Montgomery St., San Francisco, 5,400 ft. earth levee, incl. 57,400 cu.yd. excav., 100 ft. double 6 x 6 ft. monolithic concrete storm sewer, Contra Costa Co., for Berkeley Waterfront Co., c/o engineer. Noted Sept. 11.

Ind., Goshen—Nov. 1, by Bd. Comrs. Elkhart Co., 11 mi. ditch. $25,000. M. E. Croop, Goshen, aud.

Mass., East Boston (sta. Boston)—Oct. 23, by Park Dpt., 33 Beacon St., Boston, dredging, filling at Boston Airport. To exceed $25,000.

Mass., Hyannis Port—Oct. 20, by Hyannisport Civic Assn., and G. F. Clements, engr., 349 Main St., Hyannis, breakwater. $15,000—$20,000.

CONTRACTS AWARDED

Neb., Leshara—Leshara D. D., c/o L. O. Lamuel, secy., excavating, culvert pipe, 3 highway bridges, to Cornhucker Constr. Co., Fremont, $9,501.

Public Bond Elections

Coming Bond Elections

Filtration Plant—Ill., Wilmette, Nov. 4. $700,-000.

Bridge—Calif., Napa, $40,000.

Sewers and Disposal Plant, Extending, Widening and relocating streets—O., Cleveland, Nov. 4. $21,500,000.

Park Improvement—O., Cleveland, Nov. 4. $500,000.

Bonds Voted

Distribution System, Wells, Pumps, Etc.—Calif., Torrance, $400,000.

Reservoir—Kan., Augusta, $130,000. C. A. Haskins, Kansas City, Mo., engr.

Waterworks Works Impvts.—Tenn., Collierville, $30,000. J. T. Patrick, Mayor.

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FEDERAL GOVERNMENT

PROPOSED WORK

Ia., Mason City—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids this fall, 3 story, basement, brick, steel, rein.-con., 3rd and Delaware Sts.

Mass., North Truro—COAST GUARD STATION—U. S. Coast Guard, 408 Atlantic Ave., Boston, coast guard station ¼ mi. northwest of Cape Cod Light.

T. H., Honolulu—DREDGING—U. S. Eng. deep water channel, in Reserve Channel Area from Honolulu Harbor to Kapalama Basin.

BIDS ASKED

Florida—DREDGING—Nov. 1, by U. S. Eng., Jacksonville, dredging approximately 3,406,000 cu.yd., place measurement, Indian River portion Intracoastal Waterway from Jacksonville to Miami; adv. E. N.-R. Oct. 16.

Illinois—EARTHWORK—Oct. 30, by U. S. Eng. Office, 428 Customhouse, St. Louis, Mo., furnishing, placing 1,155,000 cu.yd. earthwork in rebuilding and enlarging levee in Nutwood Drainage and Levee Dist., Greene and Jersey Counties, on Illinois River; adv. E. N.-R. Oct. 16.

Illinois—EARTHWORK—Oct. 31, by U. S. Eng., 428 Custom House, St. Louis, Mo., placing 1,800,000 cu.yd. earthwork for rebuilding and enlarging levee in Eldred Drainage and Levee Dist., Greene Co.; adv. E. N.-R. Oct. 16.

Mass., Fall River—POST OFFICE—Nov. 6, by Treas. Dpt. at office Sup. Archt., post office. Noted Feb. 6.

Mo., Sibley—CLUMP DIKES—Nov. 3, by U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, 10,650 lin.ft. standard pile clump dikes, 9,040 lin.ft. standard revetment in Missouri River, at Jackass, Fishing River and Fire Creek Bends, about 1.7 mi. from here.

N. J., Forth Monmouth—QUARTERS—Nov. 6, by Con. Q.M., 6 double sets of non-commissioned officers quarters; adv. E. N.-R. Oct. 16.

N. Y., Brooklyn—WIRE—Nov. 7, by Signal Supply Officer, New York General Depot, Army Base, wire.

CONTRACTS AWARDED

Arkansas, Missouri and Mississippi—LEVEES—U. S. Eng., McCall Bldg., Memphis, Tenn., levee work, Pieces 31A, 31B, 31C and 31D, 24,200 cu.yd. in Lower St. Francis Levee Dist., to D. M. Easley, Wilson, Ark., $11,374; Piece 32A, 16,500 cu.yd. lower St. Francis Levee Dist., Piece 33, 21,500 cu.yd. Upper Yazoo Levee Dist., Mississippi, and Piece 34A, 33,000 cu.yd. White River Levee Dist., Arkansas, to Rodgers, Jones & Uzzelle, Memphis, Tenn., $20,663; Piece 30, 29,000 cu.yd. in Upper St. Francis Levee Dist., Missouri, to M. T. Lee, Charleston, Mo., $8,120. Grand total $40,157. Noted Sept. 11.

D. C., Wash.—BRASS FOUNDRY—Yards & Docks, Navy Dpt., improving brass foundry, to Mechanical Eng. & Constr. Corp., Mills Bldg., $34,975. Noted Oct. 9.

Fla., Pensacola — TURBO-GENERATORS — Yards & Docks, Navy Dpt., turbo-generators at Naval Air Station, to Moore Steam Turbine Corp., Wellsville, N. Y., $15,933.

Ill., Grand Lake—REVETMENT—U. S. Eng. 6,000 ft. revetment in Mississippi River to Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $120,480. Noted Sept. 25.

Ill., Great Lakes — TURBO-GENERATOR — Yards & Docks, turbo-generators at Naval Training Station, to Moore Steam Turbine Corp., Wellsville, N. Y., $18,904.

Me., Portland—BARRACKS—Con. Q.M., rebuilding barracks at Fort McKinley, to A. Archambault, 4196 Washington St., Roslindale, Mass. Noted Sept. 25.

Mass., Framingham—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office, to W. H. Hodsdon Co., Union Trust Bldg., Little Rock, Ark., $134,343. Noted Sept. 4.

N. H., Portsmouth — TURBO-GENERATOR—Yards & Docks, turbo-generators, to Moore Steam Turbine Corp., Wellsville, N. Y., $17,415.

Ore., Empire—QUARTERS—Yards & Docks, double quarters at Naval Radio Compass Station, to W. Wills, Leary Bldg., Seattle, Wash., $12,415.

Pa., Phila.—PIER—Yards & Docks, Navy Dpt., reconstructing Pier 2, to Triest & Earle, Inc., Real Estate Trust Bldg., $194,876. Noted Sept. 4.

Wash., Keyport — FENCE, etc. — Yards & Docks, extending boundary fence at Pacific Coast Torpedo Station, to E. J. Bartells Co., 1212 6th St. S., Seattle, $5,464; grading, filling, to A. C. Goerig, Seattle, $3,500.

C. Z., Panama—RADIO OPERATING BUILDING, etc.—Yards & Docks, radio operating building, masts, at Natl. Airport, to Grebien & Martins, Inc., Panama, Republic of Panama, $3,585.

RAILWAYS

PROPOSED WORK

Texas and New Mexico — Chicago, Rock Island & Pacific R.R. Co., W. H. Peterson, ch. engr., Chicago, Ill., completing surveys and takes bids about **Mar. 1, 76** mi. standard gage line of which 50 mi. will be in Texas and 26 mi. in New Mexico. $2,000,000. The 50 mi. line in Texas will be constructed by Chicago, Rick Island & Gulf R.R., a subsidiary of Chicago, Rock Island & Pacific R.R. Co.

BIDS ASKED

Ontario—See "Contracts Awarded."

CONTRACTS AWARDED

Ontario — Toronto Transportation Comn., 35 Yonge St., Toronto, electric street railway loop, on Louisa, James, Albert and Elizabeth Sts. and tracks on Elizabeth St., Toronto, day labor, $50,000. W. E. P. Duncan, ch. engr.

SUBWAYS AND TUNNELS

BIDS ASKED

N. Y., New York—Oct. 24, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., supply of track materials for use in construction Rapid Transit R.R.

GRADE CROSSINGS

PROPOSED WORK

N. J., Woodbridge—Bd. Freeholders Middlesex Co., County Records Bldg., New Brunswick, preliminary plans eliminating grade crossing at China Hill Rd. $25,000. W. Buchanan, 175 Smith St., Perth Amboy, is engr.

N. Y., Buffalo—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, and Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating William St. and South Ogden St. Crossings. $1,219,806.

N. Y., Chili—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating River Road Crossing, on Rochester-Scottsville Co. Hy. $139,400.

N. Y., Newfield — Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating Stratton and Todd crossings, on Ithaca-West Danby State Hy., 1.5 mi. south of Newfield Sta. $135,300.

N. Y., Poughkeepsie—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, reconstructing bridge carrying Union and John Sts. over tracks.

N. Y., Utica—West Shore R.R. Co., c/o New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Culver Ave. Crossing, $111,700.

N. Y., Valley Falls—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, Mass., eliminating Main and Burton St. Crossings $123,900.

N. Y., West Seneca—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Ridge Rd. Crossing, $88,600.

N. Y., West Seneca—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, and Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating Orchard Park Hy. Crossing, $196,000.

BIDS ASKED

N. Y., Courtlandt—Oct. 27, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced rein.-con. overcrossing at Main St., Bronx River Parkway extension, Contr. 310. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Oct. 16.

CONTRACTS AWARDED

N. Y., Syracuse—Grade Crossing Comn., State Tower Bldg., 200 ft. grade crossing at Midler Ave., to Walsh Constr. Co., South Warren St., $102,472.

N. C., High Point—City, E. M. Knox, mgr., steel, concrete underpass under Southern Ry. Co. tracks, Ward St., to Porter Constr. Co., Charlotte, $23,365.

DAMS

BIDS ASKED

Que., Poupore—Oct. 22, N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., partial reconstruction log slide and downstream apron of submerged dam, River du Lievre.

PIERS AND WHARVES

BIDS ASKED

N. S., Louisburg—WHARF—Oct. 28, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., wharf. $50,000.

CONTRACTS AWARDED

B. C., Vancouver—Canadian National Railways, C. S. Gzowski, ch. engr., Montreal, Que., rebuilding timber pier on pile foundations, on Barrord Inlet, recently destroyed by fire, to Northern Constr. Co., Ltd., 736 Granville St. $1,000,000.

Ont., Toronto — PIER — Provincial Impvt. Corp. Ltd., 330 Bay St., footings for amusement pier, to E. P. Muntz Ltd., Temple Bldg.; carpentry and masonry, by day labor; electric wiring, to Patterson Electric Co., 615 Yonge St.; plumbing and heating to T. Forster, 1667 Gerrard St. E. Est. $350,000. Noted Mar. 20.

Que., Quebec—WHARF—City, winter ferry wharf, to National Dock Co. Est. $93,335.

AIRPORTS

BIDS ASKED

Ind., Indianapolis—See "Waterworks."

Mass., East Boston (sta. Boston)—see "Excavation, Drainage, Irrigation, Levees, Rivers and Harbors."

CONTRACTS AWARDED

Calif., San Diego—City Council, improving municipal airport, incl. 214,744 sq.ft. 4 in. asphaltic concrete paving, to R. E. Hazard Constr. Co., 2548 Kettner Blvd., $14,925.

POWER AND LIGHTING

PROPOSED WORK

New York—New York Central Electric Corp., 50 Church St., New York, extending gas mains for furnishing gas in towns of Cohocton, Erwin, Bath and Campbell.

N. Y., Wayland—New York State Electric & Gas Corp., Ithaca, extending its plant for furnishing gas.

Pa., Shrewsbury—Amer. Telephone & Telegraph Co., Long Lines Div., Dey St., New York, soon takes bids and lets contracts placing underground cable, various sections work. To exceed $100,000.

BIDS ASKED

Mass., Boston — Oct. 28, by Boston Traffic Comn., 154 Berkley St., furnishing, installing automatic traffic control signals in various sections city. J. A. Conroy, traffic comr.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. P. Wks., City Hall, ornamental lighting system with underground work in Ventura Blvd. between Sepulveda and Lankershim Blvds., to Newbery Electric Co., 726 South Olive St. $179,488.

Texas, Missouri, Oklahoma and Kansas — Phillips Petroleum Co., Bartlesville, Okla., 4-wire telephone line from Borger, Tex., to Harrisonville, Mo., and branch line from Bartlesville, Okla. to Wichita Kan., to Graner Contg. Co., 2317 Tennessee Ave., St. Louis, Mo.

Manitoba — Northwestern Power Co., 200 Electric Realty Chambers, Winnipeg, 63 mi. double circuit steel tower transmission line from Seven Sisters Falls to Winnipeg, to Canadian Eng. & Constr. Co., 302 Nanton Bldg. Est. $1,000,000.

SPORTS AND PARKS

PROPOSED WORK

Ill., Chicago — Lincoln Park Comrs., Clark and Center Sts., W. Wright, pres., soon takes bids park improvements, incl. extensions north of Montrose Ave., extending breakwater to point in lake off Wilson Ave. to point opposite Margate Terrace, $244,000; jetty extending into lake 1,800 ft., $346,000; semi-circle bathing beach extending 1 mi. along shore at Montrose Ave., filling in new land from Montrose Ave. north to provide area 122 acres for park and recreation facilities. $1,925,000.

N. J., Asbury Park—See "Public."

N. J., North Long Branch (main Long Branch)—S. A. McNair, 388 Ocean Ave., Long Branch, sketches by H. I. Braun, 191 Bway., Long Branch, 1 story bathing pavilion, 350 bath houses, reception rooms, showers, Ocean Ave. $150,000.

N. J., Trenton—International Automobile Speedway, Inc., c/o A. E. DeMayo of Vara Eng. Co., 50 Broad St., New York, 3 mi. bowl for motor spedway, near Clarksville. $2,500,000. **Maturity about June 1.**

N. J., Union City — Bd. City Comrs., City Hall, revised preliminary plans rein.-con. stadium, 6,000 seating capacity, Summit Ave. and 26th St. $100,000. G. W. Thompson, 324 Montgomery St., Syracuse, N. Y., archt. H. Thourot, city engr.

N. J., Ventnor (br. Atlantic City)—Bd. City Council, City Hall, city park, opposite pier on waterfront. $25,000 or more. E. D. Rightmire, 530 Guarantee Trust Bldg., Atlantic City, city engr.

New York—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, 40 new playgrounds in Manhattan; 100 acre park and **from 25** to 30 playgrounds in Brooklyn; 1,200 acres new park lands, from 5 to 10 playgrounds, Queens; 1,100 acres park lands, 5 to 10 playgrounds in Richmond; 150 acre park, Ferry Point and East River, and 20 playgrounds in Bronx. $30,000,000 appropriated.

N. Y., Long Island City — Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, nurseries for trees, shrubs, near here. To exceed $100,000.

BIDS ASKED

Calif., Oakland — Miller & Pflueger, archts., 580 Market St., San Francisco, taking bids rein.-con., steel, Bway. and Hobart St., for Publix Theatres, Inc., c/o architects. $1,000,000. Noted Aug. 21.

Mass., Brockton—Nov. 1, by Y. M. H. A. and Y. W. H. A. Community Centre, A. B. Yaffe, chn. Building Comn., 65 Green St., 3 story, basement, 85 x 100 ft., brick, stone, steel athletic building, incl. gymnasium, pool, concrete found., Legion Parkway. $80,000. D. Levy, 415 Lexington Ave., New York, archt. Noted July 31.

N. J., Spring Lake—Bd. Boro Comrs., Boro Hall, bids about Nov. 1, general contract 2 story, tower, brick, steel pavilion, bath house, 40 x 100 ft. swimming pool. $160,000. E. H. Schmeider, 3rd Ave., archt. Noted Oct. 9.

N. Y., Babylon — Oct. 30, by Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, 1 story bath house at Heckscher State Park. A. E. Howland, ch. engr.; adv. E. N.-R. Oct. 16.

O., Canton—See "Schools."

CONTRACTS AWARDED

Mass., South Boston (sta. Boston)—City of Boston, Park Dpt., 33 Beacon St., 2 story, basement, brick, stone, concrete, steel bath house, concrete found., Columbia Rd. at L St., to Rugo Constr. Co., 80 Boylston St., Boston, $347,300. Est. $350,000. Noted Aug. 21.

Tex., San Antonio — Longhorn Amusement Park, Inc., c/o T. K. Crossland, pres., Concepcion Rd. and Mitchell St., retained Philadelphia Toboggan Co., engrs., Germantown, Pa., to make layout 25 acre tract for park and amusement. Noted Oct. 9.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Douglaston—Oct. 20, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating and ventilating apparatus, plumbing and drainage, electric work and lighting fixtures, for P. S. 98, Douglaston Blvd., for Bd. Educ., 500 Park Ave., New York.

N. Y., Richmond Hill Circle—Oct. 20, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating, ventilating, plumbing, drainage, electrical work and lighting fixtures for an addition to P. S. 124, 150th and South Conduit Aves., 129th and 130th Sts., for Bd. Educ., 500 Park Ave., New York.

N. Y., South Jamaica — Oct. 20, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, heating and ventilating, plumbing, drainage, electrical work, lighting fixtures for an addition to P. S. 123, 119th Ave. from 145th to Inwood Sts., for Bd. Educ., 500 Park Ave., New York.

CONTRACTS AWARDED

Mass., Lawrence—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, heating and plumbing in central railroad station, Parker St., to J. J. Gaffney Co., 385 A Haverhill St. Noted Sept. 4 under "Buildings-Unclassified."

Mass., Worcester—Commonwealth of Massachusetts, Dpt. Educ., State House, Boston, heating and ventilating in State Normal School, May and Chandler Sts., to W. A. Patterson, 58 Commodore Rd., $43,000; plumbing, to W. H. McElholm, 465 Westford St., Lowell, $12,592; electrical work, to Economy Electric Co., 22 Foster St., Worcester, $14,155. Grand total $69,747. Noted Oct. 9 under "Schools."

Vt., Burlington — Chittenden County Trust Co., E. J. Booth, pres., 114 Church St., electrical work in bank, College St., to Anderson-Coffey Co., 80 Boylston St., Boston, Mass., est. $25,000; heating and plumbing, to G. S. Blodgett Co., Inc., 190 Bank St., Burlington, est. exceeds $25,000. Noted Sept. 25 under "Banks."

Ont., Toronto—St. James Cathedral, Church and King Sts., heating system to Bennett & Wright, 72 Queen St. E.; fans and sheet metal, to A. B. Ormsby Co. Ltd., 150 Van Horne St. Est. $25,000.

UNCLASSIFIED

PROPOSED WORK

Mass., Adams—TOWER—Commonwealth of Massachusetts, War Memorial Comn., W. H. Eaton, chn., South St., Pittsfield, soon takes bids stone beacon memorial tower, on Mt. Greylock. To exceed $25,000. Noted Aug. 14.

Mass., Quincy—COMFORT STATION—City, T. J. McGrath, mayor, City Hall, comfort station. $25,000 or more. Engineer not selected.

N. J., Wayne — RADIO BROADCASTING STATION — Columbia Broadcasting System, Inc., S. Packard, vice-pres., 485 Madison Ave., New York, preliminary plans 1 story, basement, 25,000 watt radio broadcasting station and tower. $40,000. Blaw-Knox Co., 342 Madison Ave., New York, engrs. and archts.

N. Y., Long Island City—SWITCHING STATION—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, 14 x 56 ft. switching station, Skillman and Honeywell Sts., to exceed $20,000; 2 story, 17 x 19 ft. signal tower, 100th St. and Atlantic Ave., Woodside.

O., Dayton—FREIGHT TERMINAL—Dayton Motor Freight Terminal, Inc., c/o P. J. Altherr, 100 North Taylor St., 2 story, brick, rein.-con. motor freight house, incl. loading platforms, storage space, offices, 1st and Taylor Sts. $100,000. Architect not selected.

Ont., Sandwich — COAL DOCK — Pittsburg Coal Co., B. Gatfield, mgr., coal dock. $150,000.

BIDS ASKED

Mass., Boston—GUARD HOUSE, TUNNEL, etc.—Oct. 27, by J. A. Keliher, sheriff Suffolk Co., new guard house, tunnel, wall, Suffolk County Jail, Charles St.

N. J., Carlstadt—BROADCASTING STATION—American Radio News Corp., 235 East 45th St., New York, bids about Oct. 15, general contract brick, steel, Hackensack Meadows, $40,000. W. G. H. Finch, c/o owner, engr. and archt.

N. Y., Ithaca—REFRIGERATION WORK—Oct. 30, by Commissioner Education, State Educ. Bldg., refrigeration work, plant industry building, New York State College of Agriculture, Cornell University; adv. E. N.-R. Oct. 16.

N. Y., Rochester—ELEVATOR—Oct. 29, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electric elevator in dining room building at Rochester State Hospital; adv. E. N.-R. Oct. 16.

Pa., Pittsburgh—ELEVATORS—Oct. 22, by Graham, Anderson, Probst & White, archts., 80 East Jackson Blvd., Chicago, Ill., taking out present hydraulic elevators, installing new automatic electric elevators, 10 shafts, 20 stories, incl. new enclosures, tile work, roofing, repairing. Grant and 5th Sts., for H. C. Frick Estates. Union Trust Bldg., A. Callander, in charge. $350,000.

CONTRACTS AWARDED

Mass., Boston—Park Dpt., 33 Beacon St., improving Franklin Park, incl. constructing rock garden, to A. G. Tomassello, 250 Stuart St., $21,000. Est. $25,000. Noted Sept. 18.

MATERIALS

BIDS ASKED

LUMBER—**Detroit, Mich.**—Oct. 21, by Dpt. Purchases & Supplies, 2 carloads 2 x 12 in. x 16 ft. No. 1 and 1 carload 2 x 12 in. x 8 ft. No. 1 Common Fir rough.

PIPE, etc.—**Toronto, Ont.**—Oct. 21, by City, B. S. Wenp, mayor, City Hall, annual supply c.i. and lead pipe, sewer brick, mineral dust, portland cement, crushed rock, sand, gravel, rubble stone, refined asphalt, vitr. paving brick, granite sets, liquid chlorine, pig lead and sulphur dioxide. $100,000. R. C. Harris, comr.

CONTRACTS AWARDED

GRANITE BLOCK RECUTTING, etc. — **Boston, Mass.**—Dpt. P. Wks., J. A. Rourke, comr., recutting, reheading, redressing old granite blocks, to Chambers & Davidson, 37 Union Park. $9,570.

PINE TIMBERS—**Minneapolis, Minn.**—F. S. Grant, city purch. agt., 65,600 ft. pine timbers for Water Dpt., to Wilfong Lumber Co., 1111 Glenwood Ave., $2,492; 28,800 ft., to Thompson Lumber Co., 917 Washington Ave. S.E., $1,037. Noted Sept. 25.

EQUIPMENT

BIDS ASKED

ENGINES, etc.—**Detroit, Mich.**—Wayne Co. Bd. of Auditors, County Bldg., taking bids, 2 engines and generators, mechanical equipment and electrical equipment at Wayne Co. Detention Home, Forest Ave. and Rivard St. To exceed $25,000. A. H. Gould & Son, 601 Empire Bldg., engr.

TRAFFIC SIGNAL POSTS, etc. — **Brooklyn, N. Y.** — Oct. 24, by E. P. Mulrooney, comr. Police Dpt., 240 Center St., New York, traffic signal posts, lanterns, control boxes, pipe and lead covered cable on 18th Ave. and Fort Hamilton Parkway, on Bedford Ave. and Linden Blvd.

CRACKING UNIT EQUIPMENT — **Oil City, Pa.**—A. G. McKee & Co., engrs. and general contractors, 2422 Euclid Ave., Cleveland, O., in market complete equipment for cracking unit of plant for Penzoil Oil Corp., Drake Theatre Bldg.

DIESEL TYPE ENGINES—**Houston, Tex.**—Oct. 20, by Harris Co., c/o H. L. Washburn, and two 50 hp. solid injection Diesel type engines for ferry.

Buildings

RESIDENTIAL

BIDS ASKED

Calif., San Francisco — See "Contracts Awarded."

Mass., Brookline—See "Contracts Awarded."

N. J., Atlantic City — Owner, c/o L. I. Brooks, archt., 65 Madison Ave., New York, bids in December, general contract hotel. $1,000,000. Noted Jan. 16.

N. Y., New York—See "Contracts Awarded."

N. Y., Yonkers—See "Contracts Awarded."

Ore., Portland — Bennes & Hertzog, archts., Pub. Serv. Bldg., bids about Oct. 30, 7 story, basement, 100 x 200 ft. brick, steel, West Park and Clay Sts., for H. Mittleman, Portland, $300,000.

Pa., Pittsburgh—See "Contracts Awarded."

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Buildings—Residential (Continued)

CONTRACTS AWARDED

Calif., Los Angeles—R. E. Fennel, Mariposa Ave., 7 story, basement, 60 x 125 ft., rein.-con., Mariposa Ave., to Michelle Constr. Co., Architects Bldg., cost plus basis.

Calif., San Francisco—Shell-Drake Hotel Co., c/o H. C. Baumann, archt., 251 Kearny St., 16 story, steel, concrete hotel, separate contracts. Est. $250,000. Noted Sept. 11.

Mass., Brookline—Aspinwall Constr. Co., Inc., St. Paul St., 3 story, basement, irregular sized, brick, stone, plain found., St. Paul St., separate contracts. $150,000. Silverman & Brown, 51 Cornhill, Boston, archts.

N. Y., New York—Fifty-Five Central Park West Corp., H. H. Goodman, pres., 265 West 72nd St., 16 story, 241 Central Park W. to Earle & Calhoun, 265 West 72nd St. Est. $1,200,000. Contractor soon takes bids on separate contracts.

N. Y., New York—Paloma Estates, E. M. Krylewitch, 50 East 42nd St., apartments, 530 Amsterdam Ave. $2,000,000. All separate contracts are awarded. Schwartz & Gross, 347 5th Ave., archts.

N. Y., New York—Rayon Building Co., 1710 Montgomery St., 6 story, Wallace Ave. near Lydig Ave., separate contracts. $325,000. Becker & Levy, 349 East 149th St., archts. Noted Oct. 2.

N. Y., New York—New Era Constr. Corp., R. D. Zappone, 511 5th Ave., 9 story, 31 East 37th St., separate contracts. $150,000. H. E. Warren, 247 Park Ave., archt.

N. Y., New York — J. F. Phipps & First Avenue 57th Street Corp., 787 5th Ave., 18 story stores, apartments, 400 East 57th St., separate contracts. $1,500,000. R. Bullard, 607 5th Ave., archt.

N. Y., Yonkers—Glen Park Constr. Co., Bronx River Rd., 6 story, Glen and Bronx River Rds., separate contracts. $350,000.

Pa., Phila.—Oak Lane Plaza Corp., c/o A. Mueller, archt., 901 Walnut St., 6 story, basement, 150 x 185 ft., rein.-con., brick, steel, plain found., 69th Ave. and 12th St. separate contracts. Est. $400,000. Architect taking bids on sub-contracts.

Pa., Pittsburgh—J. F. Casale (builder), 416 Greenfield Ave., 3 story, basement, 52 x 64 ft., brick, tile, steel, ornamental iron, marble, Park Lane between Hobart and Phillips Sts., separate contracts. $150,000. N. Leebov, Jones Law Bldg., archt.

Wash., Spokane—J. F. McDonald, Grand View Apartments, 9th St. west of Grand St., to P. J. Young, Spokane. Est. $150,000.

CLUBS

PROPOSED WORK

Mass., Canton—Blue Hill Country Club Building Co., B. E. Morse, plans by M. Sullivan, 100 Boylston St., Boston, 2 story, basement, brick, stucco clubhouse, plain found., Pecunit St. $160,000.

Mass., Somerville (br. Boston)—Somerville Y. M. C. A., 101 Highland Ave., new sketches by W. Atherton, 148 State St., Boston, reconstructing 4 story, basement, brick building, Highland Ave. $150,000.

N. J., Freehold—Knights of Columbus plans by E. H. Schmeider, 3rd Ave., Spring Lake, 2 story, basement, brick, steel. $150,000. Noted Aug. 14.

N. J., Jersey City—Knights of Columbus Council 137, 441 Jersey Ave., plans by Kelly & Cowan, 921 Bergen Ave., 3 story, basement, brick, steel, plain found. $200,000.

N. Y., New York—Railroad Y.M.C.A., National Bureau Y.M.C.A., 347 Madison Ave., bids after Oct. 20, general contract club, $2,000,000. Warren & Wetmore, 16 East 47th St., archts. Noted May 8.

N. Y., New York—Societies Realty Co., F. A. Vanderlip, pres., altering and constructing addition to club, auditorium, office, 113 West 43rd St. $500,000. L. Jallade, 15 East 47th St., archt. **Maturity in summer.**

O., Cleveland — Oakwood Club, c/o J. M. Berne, pres., 1520 Warrensville Center Rd., plans by C. R. Greco, Guardian Bldg., 2 story, brick, stucco, addition. $150,000.

BIDS ASKED

Conn., New Haven—Oct. 22, by Y.M.C.A., c/o D. Orr, archt., 956 Chapel St., brick, steel, stone addition, to incl. gymnasium, classrooms, offices, administration, 12 bowling alleys, Chapel and Howe Sts. $250,000. Noted June 5.

N. J., Red Bank—J. C. and G. A. Delatush, archts., 9 Broad St., bids about Nov. 1, general contract 2 story, basement, brick, steel club house, Riverfront, for Monmouth Boat Club, A. M. Minton, pres. $150,000. Noted Sept. 25.

O., Hamilton—Oct. 23, by Y. M. C. A., 3 story, basement, brick, steel, concrete club, Dayton St. $300,000. F. B. and A. Ware, 1170 Bway., New York, archts. Noted Sept .11.

CONTRACTS AWARDED

N. J., West Orange — Bottelli & Bottelli, archts., 45 Branford Pl., Newark, 2 story, basement, 40 x 115 ft., brick, steel, addition, Eagle Rock Ave., to J. Christenson, 296 Tremont Ave., Orange, for Crestmont Golf Club, Eagle Rock Ave. $150,000. Noted Sept. 25.

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HOSPITALS

PROPOSED WORK

Mass., Needham — Town, W. M. Mitchell, hospital. $150,000 or more. Architect not selected.

Mich., Battle Creek—Battle Creek General Hospital Assn., Ward Bldg., 6 story, basement, brick, steel, rein.-con., plain found., Irving Park site. $250,000. Project in abeyance. Berlin & Swern, 228 North La Salle St., Chicago, Ill., archts. Noted July 17.

N. Y., Albany—Albany Hospital plans by Berlin & Swern, 228 North La Salle St., Chicago, Ill., 6 story, basement, brick, steel, stone nurses home. $350,000. **Maturity in spring.**

N. Y., Poughkeepsie—Vassar Hospital, J. J. Weber, supt., will not build nurses home. Project abandoned. Noted Oct. 2.

Ont., Hamilton—City Council, plans by W. P. Witton, 7 Hughson St. S., maternity building, heating plant, nurses home, Barton St. E. $200,000.

Ont., Hamilton—Hamilton General Hospital, Barton St. E., plans by W. P. Witton, 7 Hughson St., 100 bed, brick, concrete, steel, stone hospital addition, incl. laundry, kitchen, heating plant, nurses home. $250,000.

BIDS ASKED

Ill., Aurora — Schmidt, Garden & Ericksen, archts., 104 South Michigan Ave., Chicago, bids about Oct. 20, 6 story, red face brick, Bedford stone addition, sound proof, Lincoln and Weston Aves., also power plant, laundry connected to main building by tunnel, for Copley Hospital, G. A. Anderson, pres. $400,000.

Ill., Chicago—Oct. 23, by Berlin & Swern, archts., 228 North La Salle St., 5 story, basement, U-shaped, rein.-con., brick, stone nurses home, Haddon Ave. near Leavitt St., for Lutheran Deaconess Home Hospital, 1138 North Leavitt St. $200,000. Noted Mar. 20.

CONTRACTS AWARDED

Calif., Los Angeles—Los Angeles Co. tile contract Acute Unit of County Hospital, to B. V. Collins, 1431 East 16th St., $290,135; carpentry and mill work, to J. W. Jean, 2635 North Allen Ave., Pasadena, $59,711; ornamental iron, to P. Friedman & Son, 500 Pacific Blvd., $38,809; cement finish, to Weymouth Crowell Co., 2104 East 15th St., $448,290; lawn sprinklers, to Brooks of California, 142 South La Brae Ave., $38,809. Grand total $875,754. Noted Mar. 30.

Calif., Los Angeles—Los Angeles Co., to General Fireproofing Co., 1733 South Los Angeles St., fixed equipment for Acute Unit County Hospital, $321,762; to Metal Door & Trim Co., La Porte, Ind., hollow metal $507,920, X-Ray development equipment $8,422, time card racks $795, file cases $4,349, show cases $15,200. Grand total $858,448. Noted Mar. 20.

N. Y., New York—Institute for Crippled & Disabled Children, W. E. Hope, pres., 245 East 23rd St., hospital, bulkhead, to Cauldwell Wingate Co., 101 Park Ave. Est. $300,000. Noted Sept. 25.

CHURCHES

PROPOSED WORK

Mass., Hyde Park — Most Precious Blood Roman Catholic Church, 43 Maple St., sketches by Maginnis & Walsh, Statler Bldg., Boston, brick convent, 39 Maple St. $150,000.

Neb., Omaha—St. Paul's Methodist Church, c/o B. O. Lyle, 4037 Charles St., sketches concrete, brick, stone, Corby St. between 54th and 55th Sts. $150,000.

N. J., Jersey City—St. Ann's Polish Catholic Church, J. Wrzsciano, 291 St. Paul's Ave., plans by P. Peter, 207 Market St., Newark, 2 story, basement, brick, steel church addition, rectory and garage, St. Paul's and Tonnelle Aves. $150,000. Noted Oct. 9.

N. J., Leonia—Calvary Lutheran Church 2 story, basement, brick, steel, stone, Woodland Ave. $150,000.

N. J., Woodcliff—Lutheran Church of Our Savior, H. Koeffler, chm., Hamilton Ave., and 1st Pl., sketches 2 story, basement, brick, steel, Hudson Blvd. and Hegeman Pl., $150,000. Noted Oct. 9.

N. Y., Scarsdale—Baptist Community Church, soon takes bids general contract church, $250,000. H. B. Upjohn, Grand Central Terminal, New York, archt. G. E. Merrill, 23 East 26th St., New York, consult. archt. Noted Oct. 2.

BIDS ASKED

Pa., Pittsburgh — Ingham & Boyd, archts., 1211 Empire Bldg., taking bids general contract, plumbing and heating 2 story, basement, 70 x 97 ft., stone, hollow tile, steel, marble, incl. Sunday school, kitchens, McClure and Davis Aves., for All Saints' Episcopal Congregation, C. S. Shoemaker, chn. Building Com., 1432 Termon Ave., N. S. Pittsburgh. $150,000. Noted Sept. 11.

CONTRACTS AWARDED

Mo., Clayton—Central Presbyterian Congregation, J. F. Green, chn. Building Com., 1130 Boatmen's Bank Bldg., St. Louis, general contract 1 story, basement, brick, stone, concrete, Davis Pl. and Hanley Rd., to Dickie Constr. Co., 317 North 11th St., St. Louis, Mo. Est. $300,000. Noted Sept. 18.

N. J., Cliffside—St. John the Baptist Roman Catholic Church, J. E. Kiernan, pastor, 235 Anderson Ave., 2 story, basement, brick, steel, Walker St., to W. H. Fissell, 1328 Bway., New York. Est. $150,000. Noted Oct. 9.

O., Canton—Society of Sacred Heart, Cleveland, brick, steel, concrete seminary, at Lake Cable, in Jackson Twp., near here, to Robert H. Evans Co., Mellet Bldg., $400,000. I. A. Wagner, Carthagena, will supervise construction.

N. J., Morristown—Our Lady of Grace, Sussex Ave., general conrtact 2 story, basement, sisters home, brick, steel, Sussex Ave., to H. Montague & Son, Inc., 15 Exchange Pl., Jersey City. $150,000. All sub-contracts awarded.

SCHOOLS

PROPOSED WORK

Ind., Richmond—Bd. Educ., plans by Hamilton, Fellows & Nedved, 814 Tower Court, Chicago, Ill., 2 story additions to Teft, Hibberd, Nicholson and Moore Grade Schools. $175,000.

Mass., Attleboro—City, L. A. Fales, supt. School Dpt., Sanford St., Junior High School, West Side Sect. $200,000. Architect not selected.

Mass., Belmont—Town, Building Comn., W. E. Sperry, sketches by G. E. Robinson, 80 Federal St., Boston, brick, School St. $200,000. Noted July 24.

Mass., Lawrence—City, Bd. Educ., elementary school, Essex and Warren Sts. $150,000 or more. Architect not selected.

Mass., Lexington — Town, Bd. Selectmen, Adams Grammar School, 2 story, basement, brick, East Lexington. $150,000 or more. Architect not selected.

Minn., Mapleton—Bd. Educ., J. H. Starkey, clk., plans by G. Pass & Son, and P. T. Rockey, Mankato, 3 story, basement, brick, reinf.-con. $150,000.

Minn., Minneapolis—State Bd. Administration & Finance, Capitol, St. Paul, plans by C. H. Johnston, 360 Robert St., St. Paul, 3 story, basement political science building, $300,000; 3 story, basement zoology building, $300,000; 2 story, basement astronomy building, $250,000, on State University Campus.

N. H., Exeter—Phillips Exeter Academy, and Cram & Ferguson, archts., 248 Boylston St., Boston, Mass., soon lets contract 2 story, basement, brick, steel science building, plain found., campus. $150,000 or more; plumbing, heating, electrical work, $25,000 or more. Noted May 29.

N. J., Middletown — Bd. Educ., Middletown Twp., W. H. Petingale, secy., Asbury Park, 2 story, brick, steel, addition to Port Monmouth School. $150,000. Project in abeyance. E. A. Arend, Kinmouth Bldg., Asbury Park, archt. Noted May 22.

N. J., New Brunswick—Rutgers University, J. Thomas, pres., College Ave., bids early in November, general contract rebuilding 2 story, basement, 198 x 276 ft. brick, steel, rein.-con., gymnasium, College Field. $600,000. York & Sawyer, 100 East 42nd St., New York archts. Noted May 8.

N. J., Phillipsburg—Bd. Educ., High School, brick, steel, Ingersoll Heights. $150,000.

N. J., Sea Bright—Bd. Educ. plans by H. B. Seymour, 512 McClellan Ave., Long Branch, altering and constructing 2 story, basement, brick, steel addition, River St. $150,000. Noted Oct. 9.

N. J., Somerville—Bd. Educ. Somerset Co., vocational school. $150,000. **Maturity in spring or summer.** Noted May 8.

N. J., Wood Ridge (br. Rutherford)—Church of Assumption, G. W. Aramanda, chm. com., 470 Main Ave., 2 story, basement, brick, steel school. $150,000. Architect not selected.

N. Y., Corona—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, archt., Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 16, Sycamore Ave. $350,000.

N. Y., Flushing—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, archt., Flatbush Ave. extension and Concord St., Brooklyn, P. S. 24, Holly, Robinson and Union Sts., $825,000; school addition, auditorium, P. S. 20, Sanford and Union Aves., $150,000.

N. Y., Long Island City—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, P. S. 150, 43rd Ave. and 40th St. $500,000.

N. Y., Syracuse—Bd. Educ., Education Bldg., Albany, bids in November, forestry science building, at Syracuse University.

O., Cleveland — Western Reserve University, S. S. Wilson, secy., 10940 Euclid Ave., plans by Garfield, Stanley Brown, Harris & Robinson, National City Bldg., brick, steel, concrete men's dormitory, Euclid Ave. $750,000 funds being raised. Noted Apr. 17.

Ore., Sheridan—Pioneer Educ. Assn., c/o J. Piete, 3220 43rd St. S. E., Portland, group buildings for male noviate school, 2 mi. south of here. $300,000. Engineer and architect not selected.

R. I., Johnstown (mail Providence) — St. Thomas Roman Catholic Parish, J. O'Reilly, pastor, 65 Fruit Hill Ave., Providence, parochial grade school. $200,000. Architect not selected.

Tex., San Antonio—Bd. Educ., Lavaca and Water Sts., plans by Phelps & DeWees, Gunter Bldg., school, plain found., Gorman and Rosary Sts. $150,000.

Schools (Continued)

BIDS ASKED

Del., Greenwood—Delaware School Foundation, A. J. Taylor, vice-pres., Du Pont Bldg., Wilmington, bids about Nov. 15, 3 story, basement, brick, steel, rein.-con. high school, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Sept. 25.

Ind., Ft. Wayne—Oct. 21, by Bd. School Comrs., brick, steel school, Oxford and Monroe Sts. $150,000. L. Bowers, 4215 Fairfield Ave., archt. Noted Oct. 8.

Ind., Jeffersonville—Oct. 30, by Bd. School Comrs., alterations, additions to Jeffersonville High School, Ingramville and Port Fulton Schools. $155,000. W. C. Findt, 203 Elsby Bldg., New Albany, archt.

Me., Lewiston—Bates College, H. W. Howe, taking bids 4 and 5 story, basement, 55 x 150 ft., brick dormitory, plain found. $160,000. Miller & Beal, ne., 465 Congress St., Portland, archts. Noted Oct. 9.

Md., Baltimore—Oct. 22, by Bd. Awards, 3 story, 52 x 152 ft., brick administration building, 25th St. near St. Paul St., for Dpt. Educ. L. R. White, Jr., archt. and H. G. Perring, engr., both of Court Square Bldg.

Mass., Jamaica Plain (sta. Boston)—Oct. 30, by City of Boston, Dpt. School Buildings, 2 story, basement, brick, limestone intermediate school, plain found., Centre St. and Pershing Rd. $150,000. McLaughlin & Burr, 88 Tremont St., Boston, archts. Noted Oct. 9.

N. J., Hillside (sta. Elizabeth)—Bd. Educ., H. Doremus, pres., Township Hall, bids about Nov. 15, 2 story, basement, brick, steel, rein.-con., Conant and Winchester Aves. $175,000. J. Wind, Jr., 1450 North Broad St., Newark, archt. Noted Oct. 2.

N. J., Irvington (br. Newark)—Oct. 20, by Bd Educ., 1253 Clinton Ave., general contract altering and constructing 2 story, basement, brick, steel addition, Grove St. $170,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted Sept. 18.

N. J., North Plainfield (mail Plainfield) — Bd. Educ., 125 Somerset St., bids about Nov. 15, 2 story, basement, brick, steel. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archt. Noted Sept. 25.

N. J., Rutherford—Bd. Educ., High School, bids about Dec. 1, 2 story, basement, addition to Washington School, Wood St. $150,000. E. I. Williams, 131 West Passaic Ave., archt. Noted Aug. 21.

N. J., Rutherford—Bd. Educ., High School, bids about Dec. 1, 2 story, basement, brick, steel addition to Lincoln School, Montross Ave. $150,000. E. I. Williams, 131 West Passaic Ave., archt. Noted Aug. 21.

N. Y., Buffalo—Oct. 21, by E. B. Green & Son, archts., 1 Niagara Sq., "Crosby Hall," 3 story, basement, brick, steel school, 3455 Main St., for University of Buffalo.

N. D., Minot—Oct. 20, by State Bd. Administration, E. G. Wanner, secy., Bismarck, 3 story, basement, 40 x 168 ft. womens dormitory, rein.-con., brick, stone, State Teachers College, $150,000. I. L. Bush, Minot, archt. Noted Aug. 1, 1929.

O., Cleveland—Nov. 3, by Bd. Educ., F. G. Hogen, dir., John Marshall High School, 3 story, basement, 224 x 416 ft., brick, steel, concrete, West 140th St. and Lakota Ave. $800,000. G. M. Hopkinson, Auditorium Garage Bldg., archt. Noted Sept. 4.

O., Canton—Oct. 29, by Bd. Educ., 2 story, basement, brick, school, incl. gymnasium, swimming pool and auditorium, Rowland Ave. N. E., $150,000. Firestone & Christman, Renkert Bldg., archts. Fulton & Taylor, 8120 Euclid Ave., Cleveland, consult. archts.

Ont., Fort William—Oct. 29, by Bd. Educ., 3 story, basement, brick, stone, concrete, steel technical school. $400,000. R. E. Mason, Francis Blk., archt. Noted Sept. 18.

CONTRACTS AWARDED

Md., Baltimore—Bd. Awards, 3 story, brick, stone, concrete addition to School 84, to P. C. Streett Eng. Co., 404 St. Paul St., $205,900. Noted Sept. 25.

Mo., Tarkio—Tarkio College, R. N. Montgomery, pres., 3 story, basement, 65 x 144 ft. administration, and 57 x 74 ft. chapel buildings, to Busboom Bros., Fairbury, Neb., $102,700; heating and plumbing, to Modern Plumbing & Heating Co., Tarkio, $18,700. Noted Oct. 2.

O., Canton—Bd. Educ., Canton Twp. Rural School Dist., Stark Co., at North Industry, E. S Hines, clk., fireproof addition to Prairie College School, to L. Shoeppner, Louisville. Noted Sept. 18.

Que., Montreal—Notre Dame de Grace School, constructing 24 classroom school, two 4 story teachers residences, concrete, brick, to Leclair J. A. A. Dupuis Ltee. Est. $307,500.

THEATRES

PROPOSED WORK

Calif., Alameda — Alameda Amusement Co., c/o Miller & Pflueger, archts., 580 Market St., San Francisco, steel, rein.-con. theatre, Central Ave. and Park St. $350,000.

N. Y., White Plains—Warner Bros. Pictures, Inc., 321 West 44th St., New York, plans by J. Eberson, 370 Lexington Ave., New York, theatre, Mamaroneck Ave. between Main and Martine Aves. To exceed $150,000. **Maturity after Apr. 1.**

Va., Newport News—Myron Engel Interests, Birmingham, Ala., soon takes bids general contract theatre, 1,400 seating capacity, $250,000. F. H. McDonald & Co., Southeastern Trust Co. Bldg., Atlanta, Ga., archts. Paramount-Publix Theatres, Paramount Bldg., New York, lessee.

BIDS ASKED

Ia., Davenport—Oct. 20, by Third and Brady Streets Corp., owner, c/o G. M. Bechtel, dir., and United Realties Co., lessee, 9 story, 150 x 192 ft., rein.-con., brick, steel, stone, terra cotta, incl. hotel, 3rd and Brady Sts. $2,000,000. A. S. Graven Co., 307 North Michigan Ave., Chicago, Ill., archts.

O., Fostoria—A. S. Graven, Inc., archts., 100 North La Salle St., Chicago, Ill., taking bids 2 story, brick theatre, office building, for N. E. George, Fostoria. $150,000. Noted Aug. 15.

CONTRACTS AWARDED

Ill., Aurora—Publix-Balaban-Katz Corp., 175 North State St., Chicago, general contract theatre, to Kaiser-Ducet Co., Joliet. Est. $1,000,000. Noted Oct. 1.

N. M., Santa Fe — N. Solmon, general contract 3 story, basement, brick, steel theatre, to Underhill Constr. Co., Oliver Eakles Bldg., Amarillo, Tex., $150,000.

N. Y., New York—J. D. Rockefeller, Jr. and Metropolitan Square Corp., 61 Bwy., amusement, radio studio development, to Todd & Robertson, 347 Madison Ave. Contractor takes bids in December for foundations, etc. Noted July 3.

BANKS

BIDS ASKED

O., Hamilton—Oct. 20, by Second National Bank, 4 story, basement, stone, steel, concrete, $300,000. Weary & Alford Co., 1923 Calumet Ave., Chicago, Ill., archts. Noted Sept. 18.

OFFICES

PROPOSED WORK

Mass., Boston — Tomfohrde Building, A. P. Pearce, Jr., trustee, 15 State St., sketches by Blackall, Clapp & Whittemore, 31 West St., 4 story, probably brick, steel office, 37-51 Court St. To exceed $150,000.

Mass., Marlboro — A. T. Nelson, 1 Federal St., Boston, 4 or 5 story, brick, steel, office, stores, Main St. $125,000-$150,000. Architect not selected.

N. Y., New York—Houston Properties Corp., 10 East 40th St., 20 story office, Madison Ave. from 38th to 39th Sts., to exceed $1,000,000. **Maturity late in spring.** Noted Jan. 9.

N. Y., Syracuse — Syracuse Lighting Co., South Warren St., plans by M. King, East Fayette St., office building, garage and repair shop, service and storage building, 10,000,000 cu.ft. capacity water gas plant, pumping plant, 810,000,000 cu.ft. capacity gas holder, auxiliary garage, Mechanic and Hawthorne Sts. $3,000,000. Taking bids now for auxiliary garage.

Tex., Houston—J. H. Jones, Bankers Mortgage Bldg., plans by A. C. Finn, Bankers Mortgage Bldg., 10 story, basement ,100 x 125 ft. office, Travis and Walker Sts. $1,250,000.

Ont., Toronto — Bank of Nova Scotia, 39 King St. W., plans by J. M. Lyle, 230 Bloor St. W., office, King and Bay Sts. $2,000,000 upwards.

BIDS ASKED

N. J., Newark—W. E. Lehman, archt., 972 Broad St., bids about Dec. 1, general contract 2 story, basement, 40 x 150 x 250 ft., brick, steel office, showroom, warehouse, Frelinghuysen Ave., for Majestic Radio Sales Co., 259 Madison Ave., Perth Amboy. $150,000. Noted Sept. 11.

N. J., Paterson — Goodman & Shulman, archts., 20 Smith St., bids about Dec. 1, general contract 10 story, basement medical tower office, Bway. and Auburn Sts., for Medical Tower Building Corp., c/o architects. $600,000. Noted Aug. 21.

Okla., Oklahoma City—Starrett Bros., general contractors, 8 South Dearborn St., Chicago, Ill., now at 607 Oklahoma Savings Bldg., 306 North Robinson St., taking bids excavating and foundations for office building, for Starrett-Oklahoma Corp., Oklahoma City. Noted Sept. 11 under "Contracts Awarded."

CONTRACTS AWARDED

Calif., Los Angeles — Western National Co., c/o R. Falkernath, Jr., archt., Chamber of Commerce Bldg., 13 story, basement, 135 x 150 ft., Class A steel frame, to Mittry Bros. Constr. Co., Detwiler Bldg., $2,000,000. Noted Sept. 18.

N. Y., New York—Medical Chambers, Inc., 114 East 54th St., general contract Medical Chambers Building, 13 story, 71 x 86 ft. steel, brick, limestone, 138-44 East 54th St., to Turner Constr. Co., Graybar Bldg. Est. exceeds $500,000.

O., Dayton—Schenck & Williams, archts., 3rd Natl. Bldg., 20 story, stone, steel, rein.-con., incl. bank, West 2nd St., separate contracts, for Mutual Home and Building Assn., 2nd and Main Sts. Total est. $1,000,000.

Ont., Toronto—Owner, c/o Gibson Bros., 357 Bay St., general contract 3 story, basement, 54 x 110 ft., brick, steel office, stores, to Thomson Bros., 56 Grenville St.; structural steel, to Disher Steel Constr. Co., 80 Commissioners St. Est. $150,000.

STORES

PROPOSED WORK

N. J., East Orange—Starrett & Van Vleck, archts., 393 7th Ave., New York, rejected bids Aug. 18, 4 story, basement, brick, steel, rein.-con. department store, Main and Prospect Sts., for R. H. Muir, 546 Main St. $150,000. Will readvertise. Noted Aug. 21.

N. Y., New York—H. S. Helfer Department Store, Burnside and Walton Aves., bids about November, general and separate contracts department store, 170th St. and Jerome Ave. $150,000. Siegel & Levy, 1775 Bwy., archt.

BIDS ASKED

N. J., Sea Bright—Mulford Eng. Co., Plaza Sq., bids about Oct. 22, general or separate contracts 1 story, 100 x 100 ft., brick, steel stores, motor boat showrooms, incl. timber, concrete work, Plaza St., $150,000. Private plans. Noted Aug. 14.

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Pittsfield—W. T. Butler, c/o Berkshire Lumber Co., 2 story, basement, 80 x 125 ft., brick store, offices, plain found., South St., to H. J. Bridgman, 100 North St. Est. $150,000.

N. J., East Orange—Dablyn Realty Corp., H. Jaffe, pres., 44 Court St., general contract 2 story, basement, 100 x 175 ft., brick, steel, stores, restaurant, bowling alleys, to C. Schroeder, 1009 18th Ave., Newark. Est. $150,000. Noted Oct. 9.

N. Y., New York—Cobham Realty Co., W. Guttman, pres., 119 West 40th St., 16 story store, apartment, 41 Christopher St., separate contracts. $500,000. Boak & Paris, 10 East 40th St., archts.

Pa., Pittsburgh—J. G. McCrory Co., 1107 Bway., New York, 2 story, 2 sub-basements, 55 x 210 ft., steel, brick, concrete, 318 5th Ave., to Minton-Scobell Co., The Arcade, Cleveland, O. Est. $150,000.

PUBLIC

PROPOSED WORK

Mass., Westfield—ARMORY—Commonwealth of Massachusetts, State Quarter Master, State House, Boston, Division of Armories, steel, brick. $150,000. Architect not selected.

N. J., Asbury Park—STORES, etc.—Bd. City Comrs., City Hall, stores, bath houses, adjoining Convention Hall between 4th and 5th Aves. $150,000. Architect not selected.

N. J., Hackensack—HALL of RECORDS—Bd Freeholders Bergen Co., Court House, brick, steel, Main and Hudson Sts. $1,000,000. Tilton & Schwanoweda, 420 Lexington Ave., New York, archts. **Maturity in January.** Noted Aug. 7.

N. Y., New York—EXECUTIVE OFFICE—Bd. Educ., 500 Park Ave., executive office. To exceed $1,000,000. **Maturity early in spring.**

BIDS ASKED

N. J., Bayonne—FIRE HOUSES—Bd. City Comrs., City Hall, bids about Nov. 15, 2 story, basement, brick, steel. $150,000. L. Quien, 229 Broad St., Elizabeth, archt. Noted Sept. 11.

CONTRACTS AWARDED

Mass., Winchester—LIBRARY—Town, R. T. Hale, chn. Building Com., 1 story, basement, stone, to F. C. Alexander, 294 Washington St., Boston. Est. $175,000. Noted Sept. 4.

Tex., Dumas—COURT HOUSE—Moore Co., c/o F. S. MaKeig, judge, general contract 3 story, basement, 72 x 110 ft., brick, stone, steel, rein.-con., to C. S. Lambie Constr. Co., Amarillo, $155,000. Taking bids on subcontracts. Noted Sept. 25.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Conn., Middletown—EXCHANGE—Southern New England Telephone Co., 157 Church St., F. H. Bradley, brick, steel, College and Broad Sts. $150,000. Architect not selected.

N. J., Gladstone—ORPHANAGE—Villa O'Connor Orphanage, 2 story, basement orphanage, $150,000. Project in abeyance until fall 1931. Noted Aug. 14.

N. J., Plainfield—EXCHANGE—New Jersey Bell Telephone Co., 132 West 2nd St., bids late in December, general contract brick, steel central office building, Park Ave. and West 5th St. $150,000. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Sept. 4.

N. Y., Brooklyn—MAUSOLEUM—New York Mausoleum Assn., 7 DeKalb Ave., plans by G. Webb, 10 East 43rd St., New York, 2 story, 79 x 161 ft. mausoleum, Cypress Hills Cemetery. $700,000.

N. Y., Flushing — PROFESSIONAL — Corporation, c/o H. P. Mencken, 320 Grand Ave., Astoria, 6 story professional building, Roosevelt Ave., Main and Locust Sts. $600,000.

Pa., Grove City—MEMORIAL CHAPEL—Mercer Co. Memorial Park, G. Peranteau, in charge, Grove City, plans by Clepper & Clepper, McDowell Natl. Bank Bldg., Sharon, 1 story, basement, 50 x 70 ft., Indiana limestone, terra cotta, tile memorial chapel and cemetery development on Sandy Lake Rd., near here. $150,000.

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Buildings—Unclassified (Continued)

BIDS ASKED

Mich., Ypsilanti—UNION—Normal Alumni Assn., Michigan State Normal College and Detroit & Security Trust Co., 201 West Fort St., Detroit, soon lets contract 3 story, basement, 150 x 200 ft., brick, rein.-con., steel, limestone union building club house, plain found., Cross St. $300,000. F. Eurich, Jr., 5239 Woodward Ave., archt. Noted Sept. 4.

N. J., Newark—MARKET—F. H. Koenigsberger, archt., 48 Walnut St., bids about Oct. 15, general contract 2 story, basement, brick, steel, plain found., Washington and Linden Sts. for Steuben Holding Corp., 60 Park Pl. $150,000. Noted Oct. 9.

CONTRACTS AWARDED

Ill., Hinsdale—HOME—Bd. Trustees Godair Memorial Old Peoples Home, (1st unit) red brick, stone, on 20 acre tract, 63rd and Madison Sts., southwest of here, to J. T. Schiess & Co., Downers Grove. Est. $300,000.

Mass., Roxbury (sta. Boston)—COMMUNITY HOUSE—Robert Gould Shaw House, Inc., 6 Hammond St., 3 story, basement, brick, steel, plain found., to K. W. Richards, 1151 Great Plain Ave., Needham, est. $150,000. Noted Aug. 21. Heating and plumbing to A. E. Roberts, 70 Washington St., Boston, and electrical work, to Keough Electric Co., 140 Oliver St., Boston. Est. $25,000.

Mo., Kansas City—EXCHANGE—Southwestern Bell Telephone Co., 11th and Pine Sts., St. Louis, and E. T. Mahood local mgr., Kansas City, general contract 2 story, basement, 78 x 137 ft., brick, steel, rein.-con., to Miller-Stauch Constr. Co., 503 Railway Exch. Bldg. Est. $125,000. Noted Sept. 11.

N. J., South Orange—EXCHANGE—New Jersey Bell Telephone Co., general contract 3 story, basement, brick, steel, plain found., to Carlson Co., Walnut St., Montclair. Est. $150,000.

O., Columbus—UNION STATION—Graham, Anderson, Probst & White, archts., Railway Exch. Bldg., Chicago, Ill., altering, steel marble, tile, terra cotta union station, for Columbus Union Terminal Co., to Boyajohn & Barr, 299 South Front St., $300,000; steel, to McClintic-Marshall Co., Rankin St., Pittsburgh, Pa., $100,000; track changes incl. placing 2,500 lin.ft. concrete platforms, 16 ft. 8 in. wide, to Fritz-Rumer-Cooke Co., 209 South 3rd St., $200,000. Grand total $600,000. Noted Sept. 25.

O., Youngstown—NEWSPAPER PLANT—J. W. Thomas, archt., 3868 Carnegie Ave., Cleveland, general contract 2 story, basement, brick, rein.-con., to Heller-Murray Co., 222 West Rayen St., $200,000, for Youngstown Telegram Co., c/o Scripps Howard Co., 230 Park Ave., New York. Noted Oct. 2.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Fresno — SULPHUR MILL — Sunland Sulphur Co., 2148 Inyo St., plans by J. H. Wright, plant supt., 2148 Inyo St., mill. $75,000 or more.

Ga., Swainsboro — BOTTLING PLANT — Alabama Coca Cola Bottling Co., J. E. Eros, genl. mgr., Anniston, Ala., sketches by Pringle & Smith, Norris Bldg., Atlanta, 1 story, basement, brick, steel. $50,000.

Mass., Bourne—PLANT—R. Bigelow, Monument Beach, 1 story, 60 x 200 ft. boat building plant, steel, near Canal. $40,000-$50,000. Private plans.

Mass., Cambridge—CLEANSING PLANT—H. J. Shea, c/o W. J. Galvin, archt., 30 Brattle St., revised plans 2 story, brick, Massachusetts Ave. opposite Ellery St. $50,000.

Mass., Wilmington — PACKING PLANT — Wilmington Packing Co., Inc., E. T. Murphy, genl. mgr., sketches rebuilding 1 and 2 story, brick, concrete, concrete found., recently destroyed by fire, Eames St. $40,000 or more. Private plans.

N. J., Bound Brook — FACTORY — J. N. Pierson & Son, archts., 198 Jefferson St., Perth Amboy, revising plans and takes bids about Nov. 1, general contract 1 story, basement, brick, steel, plain found., for Pathe Exchange, Inc., Middlesex Boro. $40,000. Noted Oct. 9.

N. J., Hillside—FACTORY—Union Carbide & Chemical Co., subsidiary Carbide & Carbon Corp., 30 East 42nd St., New York, soon lets contract pyrofax gas factory, Ramsey Ave. $40,000. Noted Sept. 11.

N. J., Hoboken — FACTORY — Gatti Paper Stock Corp., 13th and Monroe Sts., plans by C. F. Dieffenbach, 84 Washington St., 2 story, basement, 90 x 195 ft., brick, steel, rein.-con. $40,000 or more.

N. J., New Brunswick—PLANT—Anheuser-Busch Co., 721 Pestlozi St., plant for manufacture of cartons, East Brunswick Twp. $1,000,000.

N. Y., Maspeth—LAUNDRY—J. Hoffman, 8534 121st St., plans by H. Brucker, 2424 Myrtle Ave., Brooklyn, 75 x 100 ft., laundry, 55th St. and Nurgo Ave. $40,000.

O., Cleveland — REFLECTOR FACTORY — Roberts Realty Co., c/o L. Skolnik, archt., Auditorium Garage Bldg., 1 story, 47 x 108 ft., brick, steel, 3856 Woodland Ave. $40,000.

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R. I., Saylesville—PLANT—Sayles Finishing Plants, Inc., c/o Lockwood Greene Engineers, Inc., engrs., 24 Federal St., Boston, Mass., soon lets contract 2, 4 and 1 story, 45 x 130 ft., 30 x 40 ft., 65 x 70 ft. and 15 x 55 ft., brick, steel, additions, incl. bleachery, plain founds., exceed $40,000; heating, electrical work and elevators, to exceed $25,000. Noted Oct. 2.

B. C., Vancouver—PLANT, etc.—Vegetable Oils Ltd., C. F. Millar, plant, 2 wharves, 2 spur track branches, Trinity St. and waterfront.

Ont., Barrie—PACKING PLANT—Barrie Co-operative Pork Products Co., W. Wheeler, mgr., 2 story, basement, 100 x 150 ft., brick, steel, Main St. $60,000.

Quebec—STEEL MILL, etc.—Amer. Brake Shoe & Fdry. Co., 230 Park Ave., New York, steel mill, foundry, in Province of Quebec.

BIDS ASKED

Ill., Aurora—LAUNDRY—See "Hospitals."

Md., Baltimore — PLANT — Oct. 17, by F. Thomas, archt., 726 East 33rd St., 2 story, basement, 75 x 118 ft., ice cream manufacturing plant, brick, rein.-con., steel, Smallwood St., for Arundel Ice Cream Co., 1501 West Baltimore St.

N. J., Elizabeth—AUTO BODY FACTORY—W. L. Finne, archt., 1201 East Grand St., taking bids altering and constructing 1 story, basement, brick, steel addition, Chestnut St., for Fisher & Dackerman, 1153 Chestnut St. $40,000.

N. J., Jersey City—ICE PLANT—Mongiello Bros., 625 Communipaw Ave., bids about Nov. 1, general contract 1 story, basement, 100 x 100 ft., brick, steel, stone, plain found. $50,000. C. H. Ziegler, 26 Journal Sq., archt. Noted Oct. 2.

N. J., Newark—FACTORY—M. N. Shoemaker, archt., 10 Bleecker St., bids about Oct. 15, general contract altering 2 story, basement, brick, steel, rein.-con., 361-65 6th Ave., for Weldon Roberts Rubber Co., 18 Oliver St. $40,000.

N. J., Paterson—FACTORY—Lee & Hewitt, archts., 152 Market St., bids about Nov. 15, general contract 2 story, basement, 65 x 165 ft., brick, for J. S. Royal, c/o architects. $40,000. Noted Sept. 25.

Pa., St. Marys — CARBON PLANT — Spear Carbon Co., D. Miller, genl. supt., taking bids 1 story, 82 x 119 ft., corrugated siding, steel, concrete, C. Lyons, St. Marys, archt.

Tex., Grand Saline — SALT PLANT — See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Salem—LAUNDRY—Salem Laundry Co., 51 Lafayette St., 4 story, basement, brick addition, Derby St., to Pitman & Brown, 11 Washington St. Est. $40,000. Noted Oct. 2.

O., Lorain — CREAMERY PLANT — Lorain Creamery Co., 1 story, 55 x 115 ft., brick, steel, to H. J. Leighton, 783 6th Ave. Est. $40,000. Noted Sept. 11.

Tex., Grand Saline—SALT PLANT—Morton Salt Co., 208 West Washington St., Chicago, Ill., 1 and 2 story, concrete, steel, day labor and contracts, under supervision of Allen & Garcia, engrs., McCormick Bldg., Chicago, Ill. Interested contractors and dealers should communicate with owner at once.

Wis., Milwaukee — FACTORY — Filer & Stowell Co., 219 Becher St., 3 story, basement, brick, steel, to Meredith Bros., 253 Washington St. Noted Sept. 4.

Ont., Brockwell — WIRE and ELECTRIC PLANT E. F. Phillips Electrical Co. Ltd., Kingston Rd., general contract five 1 story concrete, steel, brick additions, to C. E. Deakin, 1440 St. Catharine St. W., Montreal, Quebec; structural steel, to Hamilton Bridge Co. Ltd., Bay St. N., Hamilton. Est. $500,000.

GARAGES

PROPOSED WORK

N. J., Jersey City—Burstyn Heftler Corp., 821 Bergen Ave., 8 story, basement, 95 x 130 x 225 ft., brick, steel garage Bergen Ave. and Academy St. $450,000. Project in abeyance. Noted Sept. 18.

N. J., Jersey City—J. Goldenberg, 80 Woodland St., Englewood, revised plans by C. Shilowitz, 26 Journal Sq., 4 story, basement, brick, steel garage, showrooms, Sip and Summit Aves. $250,000. Noted May 1 under "Contracts Awarded."

N. Y., Flushing—S. Lax, 4556 171st St., 189 x 275 ft. service garage, Willets Pl. and 36th Aves. $50,000. **Maturity after Apr. 1.** Noted Sept. 11.

N. Y., Long Island City—Brein Holding Corp., 247 Sanford Ave., Flushing, plans by W. Hohauser, 17 West 44th St., New York, 2 story, 125 x 192 ft., brick, steel service garage and storage, 40th Rd. and Main St. To exceed $40,000.

N. Y., New York—H. Mandel, 10 East 40th St., plans by Farrar & Watmough, 10 East 40th St., storage and service garage. To exceed $150,000. Noted Oct. 9.

BIDS ASKED

N. J., Newark—Schwartz Bros. Truckmen, Inc., 263 Lafayette St., taking bids general contract 1 story, basement, 100 x 150 ft., brick, steel garage, Roe St. $150,000. Private plans.

See proposal advertising on page 97

CONTRACTS AWARDED

Conn., Darien—Karl Melia Chevrolet Co. Post Rd., brick, steel auto sales and service station, to Wm. J. Lyons, 64 Wall St., Norwalk. Est. $40,000 incl. equipment.

SHOPS AND FOUNDRIES

PROPOSED WORK

Tex., Cleburne — ROUND HOUSE — Gulf, Colorado & Santa Fe Ry. Co., c/o F. G. Pettibone, genl. mgr., Cleburne, and Galveston, brick, $150,000. F. Merritt, Galveston, ch. engr. Private plans.

BIDS ASKED

Calif., San Francisco—SHOPS—See "Warehouses."

Conn., New Haven—MACHINE SHOP, etc.—Connecticut Bearings Co., Inc., F. C. Bradley, 294 York St., taking bids 1 story, basement, wings, brick, steel machine shop, garage, concrete found., 59 Goffe St. $40,000. Private plans.

CONTRACTS AWARDED

Pa., Erie—SHOPS—Bender Marine Sales Co., G. D. Bender, in charge, 9th and Peach Sts., general contract 1 story, mezzanine, 118 x 170 ft., glazed cinder block, steel, concrete, incl. display room, marine sales, service and boat storage, Dock E of Steel Pier at end of State St., to H. Platt Co., 1006 Palace Hardware Bldg. Bids soon on sub-contracts.

POWER PLANTS

PROPOSED WORK

Ont., Toronto—Toronto Hydro-Electric System, 225 Yonge St., soon takes bids concrete, steel, stone, brick electric substation, George St. $100,000.

BIDS ASKED

Ill., Aurora—See "Hospitals."

Mass., Boston — Beacon Laundry Co., 14 Lenox St., taking bids 1 story, concrete boiler house addition to laundry. C. T. Main Ct., 201 Devonshire St., engrs.

Mich., Detroit—Oct. 21, by D. C. Grobbell, acting secy. Dpt. Water Supply, 735 Randolph St., furnishing, delivering, erecting soot blowers for two 1,000 hp. steam boilers, 2 complete units to be installed at Springwells Station Power plant. G. H. Fenkell, genl. mgr. Dpt. Water Supply.

CONTRACTS AWARDED

Conn., Hartford—Hartford Electric Light Co., 266 Pearl St., 1½ story 25 x 30 ft., brick, steel, concrete power sub-station, to Industrial Constr. Co., 721 Main St. Est. $40,000. Noted July 17.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., altering 1 story, brick, rein.-con. electric sub-station, incl. 2 rotary convertors, concrete found., 484 Atlantic Ave., to Engineering Constr. Co., 6 Beacon St. Est. $40,000.

Mich., Detroit—Bd. Water Comrs., 735 Randolph St., substructure 2 story switch house, turbine house, east foundation wall boiler house, West Warren Ave., at Detroit Terminal R.R., Dearborn, to W. E. Wood Co., Union Trust Bldg., $266,960. Noted Sept. 4.

W. Va., Boncar—West Virginia Hydro-Electric Co., subsidiary Union Carbide & Carbon Co., 30 East 42nd St., New York, boilers, furnaces, pulverized fuel burning equipment, to Combustion Eng. Corp., 200 Madison Ave., New York. Est. $500,000.

WAREHOUSES

PROPOSED WORK

N. Y., Jamaica—Queensboro Storage Warehouse, Inc., plans by H. T. Jeffery, 90-50 Parsons Blvd., 6 story, warehouse, Van Wyck Blvd. and 94th Ave. $150,000.

N. Y., Long Island City—Boem Realty Corp., 250 Park Ave., New York, plans by Otis Elevator Co., 41-25 29th St., altering warehouse, Queens Blvd. and Van Dam St. $150,000.

N. Y., Northport—Long Island Lighting Co., industrial warehouse, to replace building damaged by fire. To exceed $75,000. **Maturity indefinite.**

N. Y., Woodside—Rubel Ice Co., 937 Fulton St., plans by Cohn Bros., 350 Stone Ave., 47 x 80 ft. ice storage, Pell and Fillmore Sts. $40,000.

BIDS ASKED

Calif., San Francisco—Truscon Steel Co., Call Bldg., taking bids 1 story, steel, concrete warehouse, shops, and installing overhead crane, Carroll and Newhall Aves. $50,000.

CONTRACTS AWARDED

Ia., Sioux City—John Deere Co., Moline, 3 story, basement, 69 x 186 ft. and 1 story, 60 x 80 ft., rein.-con., brick warehouse, office, to W. A. Klinger, Inc., Warnock Bldg. $80,000. Noted June 19.

Pa., Pittsburgh — Fort-Third Street Warehouse Co., Union Trust Bldg., remodeling produce warehouse, incl. rebuilding parts of walls and roof blown out by explosion, interior repairing, steel sash, built-up roofing, to Hillsmith & Co., Winters Bldg., Dayton, O. Est. $40,000. Atlantic & Pacific Tea Co., 1016 Grant Bldg., lessee.